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Proposed Professional Panel

There is so little competition amongst foundries that co-operation is quite easy. One form of co-operation has taken the form of a visit by four amateur experts—all members of the same manufacturers' association as the concern inspected—followed by oral and written reports. In no case have we noticed the inclusion of a member who could really be called a competitor. The results have, we believe, been really useful. The advice given quite often tallies with the notions of either the foundry staff or the top management, and obviously it can either narrow or widen internal differences of opinion. Moreover, the suggestions put forward will increase with the size of the plant visited purely on account of mass. The visits are obviously concerned with the debit side of the industrial balance sheet and all the credit aspects in the conduct of the foundry are *force majeure* not subject to comment. This should be borne in mind by recipients of reports, and assessment should be related to this important factor.

The worth of such visits has been recognised by the British Cast Iron Research Association, and our advertising columns reveal the approaching creation of a professional panel. On invitation, this panel, when formed, will visit and report confidentially on any member's ironfoundry no matter where located. After a few inspections, they should merit the word "expert team." The qualifications of the panel must, in addition to technical knowledge of a high order, include the virtue of tact. As they give their verbal report, which we deem to be most valuable, they will note how one face will express real interest and agreement, whilst another will exhibit a modicum of animosity. This indicates that an internal "disagreement situation" has been encountered and will need a quick "on the other hand" on the part of the visiting panel. What must be uppermost in the minds of the panel, and indeed of the managements of the firms visited, is that there are "many ways of killing a cat."

The advantages to be gained from such visits are extremely numerous. The hosts learn of new techniques known to be successful; where to obtain information on aspects of the business which create difficulty; the bringing into relief of factors, which an inherent myopia brought about through the exigencies of daily routine, they have failed to notice; improved methods of transport, stocking, handling and safer working. Then there are the larger subjects of heating, fume reduction and general ventilation, heating and lighting. Improved cupola practice; the insulation of mould drying stoves; the drying and heating of ladles, are all subjects where advice is often needed and appreciated. Where much advice is to be tendered involving capital expenditure, it would be helpful if the money savers could be given priority, so that encouragement would be given to pass on to those further down the list. This professional panel is meant to supplement and not to supplant the existing arrangements. It has frequently been demonstrated that when half-a-dozen practical men talk shop, everybody learns something, and when a phase of the conversation ends by a statement that some method or new installation "saved us £500 last year," it carries more weight than a second-hand statement. Moreover, the visitors are privileged persons and, if they be honest, will acknowledge that they learn as much as they teach. This mutual interchange of experience cannot help but be of the greatest value to the industry.

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Forthcoming Events

(Secretaries are invited to send notices of meetings for inclusion in this column)

SEPTEMBER 16.

Institute of British Foundrymen.

West Wales Section :—"Tackle and Moulding in Loam of an Evaporated Body," by W. H. Hornby, at Landore Works, Richard Thomas & Baldwins, Limited, at 7.15 p.m.

Institution of Production Engineers.

Eastern Counties Section :—"Impressions of a Tour to Canada and U.S.A.," by H. H. Dawson, at the Lecture Hall, Electric House, Ipswich, at 7.30 p.m.

Institute of British Foundrymen.

SEPTEMBER 17.

West Riding of Yorkshire Branch :—Visit to W. Asquith, Limited, Halifax; presidential address; S. W. Wise Prize-winning Paper, at 2.30 p.m.

SEPTEMBER 19.

Institution of Production Engineers.

Derby Sub-section :—"Air-operated Fixtures," by C. Wilcox, at the School of Art, Green Lane, Derby, at 7 p.m.

Institution of Works Managers.

London Branch :—Film: "Mechanical Handling"; annual general meeting, at the Royal Society of Arts, John Adam Street, London, W.C.2, at 6.45 p.m.

Glasgow Branch :—Annual general meeting, at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7 p.m.

SEPTEMBER 21.

Institution of Production Engineers.

Birmingham Section :—"Industrial Incentives," by R. Marland, B.Sc., at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7 p.m.

Sheffield Society of Engineers and Metallurgists.

Visit to Appleby-Frodingham Steel Company, Limited, Scunthorpe.

SEPTEMBER 22.

Institution of Works Managers.

Sheffield Branch :—"Productivity and the Engineer," by D. L. Hulbert, at the Grand Hotel, Sheffield, at 7 p.m.

British Iron and Steel Research Association.

Conference on Foundry Steel Melting, at Ashorne Hill, Leamington Spa. (Two days.)

Forty Years Ago

In our issue of September, 1909, the Editor made an appeal for the creation of a London Branch of the British Foundrymen's Association. A full account of the 6th annual meeting of this body is printed, and the fees were raised to a guinea for members, half-a-guinea for associate members and 3s. for associates. In a Paper by Cook, on the "Effect of Structure on the Physical Properties of Cast Iron," much reference is made to one giving 18.3 tons per sq. in. There is an article on cast-iron turning tools, which because of their cheapness could at that time find a place in the market.

"The tool has in a number of cases saved partly-machined work from being scrapped when good brands of high-speed steel were unequal to the duty." Workington Iron & Steel Company was registered with a capital of £2,000,000.

MR. E. W. COLBECK, metallurgical and research director of Hadfields, Limited, East Hecla Works, Sheffield, is to become a member of the Inter-Service Metallurgical Research Council.

Relation Between Core and Mould Joints

By "Tramp"

The joint line of a pattern is generally fairly obvious from an examination of the drawing and, in cases where there are alternative methods, choice is usually given to that which allows the greater part of the casting to be produced in the bottom portion of the mould, thus necessitating only the minimum being carried in the top box. When the job carries a number of cores, it is usual for the joint of the core box to coincide with that of the mould. This is not always arranged by pattern-makers, and thus trouble is often experienced in the foundry in assembling the cores, as the tapers of the mould and core do not correspond, especially if the joint of the core box be at right angles to that of the mould.

When it is essential that the joint of the core is in a different plane from that of the mould, the various tapers necessary to remove the core from the box should be marked on the pattern-maker's full-size layout, together with the tapers of the core prints, so that the various tapers can be compensated by constructing the core box in such a way that the core fits the mould without having to resort to the use of a file to adjust it to suit the core print.

The joint of a core may sometimes have to be different from that of the mould so as to facilitate the drying of the core without distortion, as large, unsupported lumps of sand in a vertical position are liable to sag. In such cases, to avoid trouble in the foundry, compensating tapers must be allowed.

Band Saw Data

We have abstracted the following information from the "Edgar Allen News":—

Materials.	Number of teeth per in.	Speed of Blade in ft. per min.
Brass castings, soft	10–12	500–700
Brass castings, hard	12–14	150–200
Bronze castings	10–14	500–800
Cast iron	12–14	100–150
Malleable iron	12	150–200
Manganese bronze	10–12	150–200
Metal-wood	14	1,000–2,000

Death of Mr. A. J. K. While

As we close for press, we learn with regret of the death, yesterday (Wednesday) morning, of Mr. Arthur J. K. While, chairman and managing director of G. & R. Thomas, Limited, pig-iron manufacturers, Hatherton Blast Furnaces, Bloxwich, South Staffs. A fuller obituary will appear next week.

Spheroidal-graphite Cast Iron

Disclosure of Production Details

*By W. W. Braidwood and A. D. Busby, B.Sc.**

The treatment of grey cast iron by the introduction of magnesium, to produce castings containing graphite in spheroidal form, is undoubtedly the most important current development in the ironfounding field. As cast, the product is characterised by high strength and, in suitable compositions, by appreciable ductility. Short-term heat-treatment at moderate temperature greatly increases the ductility and gives tensile properties at least equal to those of the best qualities of conventional malleable cast irons. Quenching and tempering treatments are also applicable and the final properties may be varied over a very wide range.

Interest in spheroidal-graphite cast iron is universal and intense, and engineers, metallurgists and foundrymen everywhere are eager to learn more about the properties obtainable and the production methods. Several Papers have already been published on the general subject of new-process irons.[1,2,3,4,5,6] This article will recount British experience of the magnesium process and its products.

The term "spheroidal-graphite cast iron" while correct, is cumbersome, and appears to be giving place to the expression "ductile cast iron." Throughout this article these two terms will be used interchangeably to cover magnesium-treated irons with graphite in the spheroidal form.

History

The successful development of the magnesium process is the result of research carried out over a period of years in the laboratories of the International Nickel Company, and the Mond Nickel Company.† In the course of the discussion in London of the Paper by Morrogh and Williams,[2] which described the production of nodular-graphite structures in cast iron, by treatment with cerium, reference was made to the development of the magnesium process.[7] This was on May 5, 1948, by which time the practicability of the process had been fully confirmed by repeated tests carried through on a full scale under actual foundry conditions.

Addition of Magnesium

It was believed by prior investigators that magnesium had a low solubility in cast iron and it is probable that this erroneous conclusion was reached because of the difficulties experienced earlier in effecting the addition. Magnesium boils at 1,107 deg. C. and, for that reason, attempts to introduce metallic magnesium into molten cast iron may have explosive effects. Magnesium can be added safely and efficiently, however, by first alloying it with a suitable carrier. This should preferably be a heavy metal, completely soluble in iron with beneficial effect and having a high affinity for magnesium. Nickel meets all these requirements and nickel-magnesium alloys of appropriate compositions give reliable recoveries of magnesium and fully-satisfactory results.

Replacement of nickel to greater or lesser degree is, however, sometimes practicable and work done by the Authors' colleagues on both sides of the Atlantic has resulted in the development of a range of addition alloys to suit particular circumstances. This research is being continued with every promise of further success. The preferred alloys generate a steady ebullition on addition, but there is no ejection of metal and the percentage recoveries are reliable. At this point it should be emphasised that, while proper procedure is safe, experiments by inexperienced investigators in the addition of magnesium or magnesium-containing alloys to molten cast iron, are liable to have dangerous consequences.

Effect of Magnesium Treatment

The influence of magnesium is illustrated in Table I, and in Figs. 1, 2 and 3, which show the changes effected in the structure and properties of an iron treated with increasing quantities of magnesium

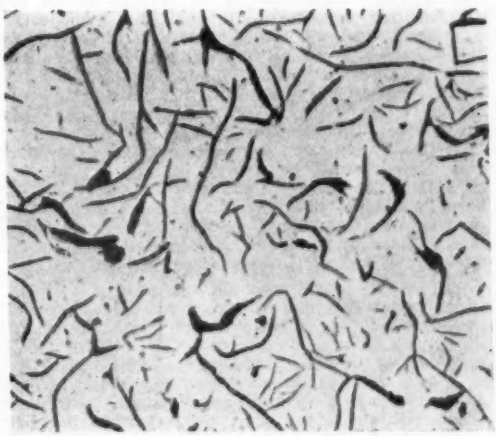

FIG. 1.—UNTREATED CAST IRON CONTAINING FLAKE GRAPHITE. UNETCHED ×100.

*Development and Research Department, Mond Nickel Company, Limited.

†British Patent Application Nos. 7909/47, 7910/47, 11080/48, 7367/49, etc.

Spheroidal-graphite Cast Iron

followed, in each case, by innoculation in the normal manner. The original coarse-flake graphite is first modified to give short, thick flakes with rounded edges, and then to give spherical bodies.

TABLE I.—*Effect of Magnesium Treatment on the Mechanical Properties of Cast Iron.*

Graphite condition.	U.T.S.	Y.P.	Elongation, per cent.	Izod ft. lb. B.S. 1349	B.H.N.
	Tons per sq. in.				
Flake	20.3	—	Nil	26	230
Compacted flake ..	35.0	—	—	45	260
Spheroidal	45.0	33	3	105	275

Tensile strength is seen to be increased by 75 per cent. at the first stage and by 125 per cent. on spheroidisation, with impact value raised by about 75 per cent. and over 300 per cent. respectively.

Influence of Graphite Form

The presence of graphite within a metallic matrix lowers most of the mechanical properties of the material, but the degree of impairment depends greatly on the form in which the graphite is present. When, as normally, it is in the form of flakes, which have a high ratio of surface area to volume and which cause many discontinuities throughout the matrix, the adverse effect on the strength and toughness of the material is considerable. Fig. 4 shows, at high magnification, the edge of a typical, normal graphite flake present in the specimen of untreated iron shown in Fig. 1. It can readily be appreciated by how much the relatively small volume of graphite in the edge of the flake reduces the strength of the iron and how the "notch effects" of the sharp edges of such flakes render the material non-ductile and seriously lower its resistance to impact. Fig. 5, also at high magnification, shows the rounded edge of a typical modified flake from the specimen illustrated in Fig. 2. The considerable improvement in properties which accompanies this modification of the graphite form is shown by the figures quoted in Table I for tensile strength and impact resistance. Fig. 6 shows, at ×1,000 diameters, a graphite spheroid. The spheroidal form is the most innocuous which graphite can take, and the great improvement in properties which accompanies the change from flake- to spheroidal-graphite can easily be understood.

There is a further consideration, that of the carbon content, which is of great practical importance. In the production of flake-graphite irons, much has been done to improve the properties by innoculation processes, which ensure absence of the most undesirable types of flake distribution. Nevertheless, it has always been necessary to limit the total-carbon contents to such levels as would give the required final properties combined with reasonable ease of handling. In spheroidal-graphite irons, probably because spherical bodies have the lowest possible ratios of surface area to mass, increase in carbon content does not lower the mechanical properties. On the contrary, the strength and toughness of the product actually improve with increase in carbon. Therefore, the good effects of high carbon in increasing the fluidity and lowering the freezing point of the molten iron can be fully utilised. For these reasons it is true to say that

FIG. 2.—PARTIALLY TREATED CAST IRON CONTAINING COMPACTED FLAKE GRAPHITE. UNETCHED ×100.

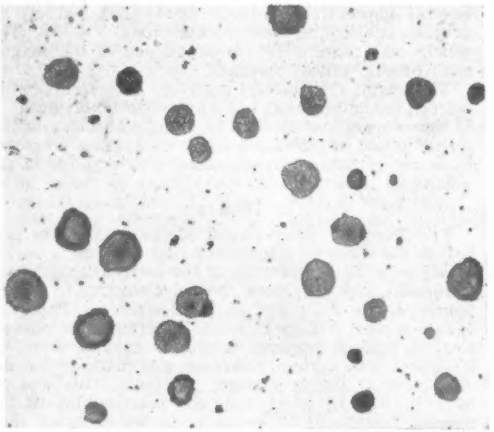

FIG. 3.—FULLY TREATED CAST IRON CONTAINING SPHEROIDAL GRAPHITE. UNETCHED ×100.

with development of the spheroidal-graphite structures, the founder is enabled to produce, at moderate cost, an iron with many of the advantages of conventional cast iron, but with properties approaching those of the graphite-free metallic matrix.

Outline of the Properties

The new-process irons are characterised not only by their high strength and toughness, but also by the wide diversity of properties obtainable. Normally, the irons, "as-cast," have mainly-pearlitic structures, with tensile strengths in the range of 35 to 45 tons per sq.

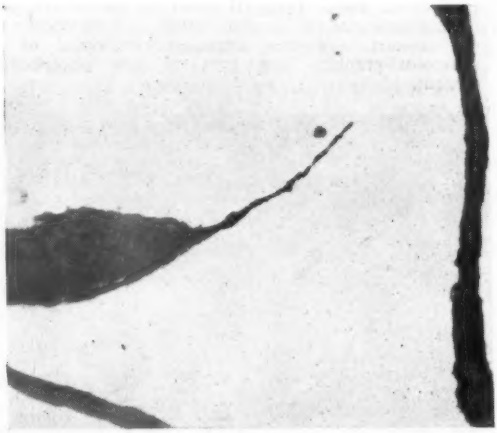

FIG. 4.—NORMAL FLAKE GRAPHITE. UNETCHED ×1,000.

in., and elongations up to 5 per cent. Short-term heat-treatment of such irons at sub-critical temperature greatly increases the ductility. Tensile strengths of 27 to 32 tons per sq. in., with elongation values in the range of 12 to 20 per cent., are normal after such annealing treatment. An indication of the malleability of ductile cast iron after sub-critical annealing is given in Fig. 7, which shows a bar, 8 in. by 1 in. by ¾ in., machined from a clover-leaf block, and twisted at room temperature. By selection of optimum composition, however, and by suitable modification of production technique, it is practicable to produce, "as-cast," that is, without separate and subsequent heat-treatment, predominantly-ferritic irons with tensile strengths in the range 30 to 35 tons per sq. in., and elongation values of 10 per cent. and above.

The impact resistance of ductile cast irons is so much greater than that of flake-graphite irons, that testing by B.S. 1349 procedure is not suitable, since specimens with elongation values of 5 per cent. or more usually remain unbroken. For purposes of comparison, Table II quotes the results obtained on unnotched specimens of 0.450 and 0.798 in. dia., in high-duty flake-graphite iron and in pearlitic and ferritic spheroidal-graphite irons.

FIG. 5.—COMPACTED FLAKE GRAPHITE. UNETCHED ×1,000.

TABLE II.—*Comparative Impact Values of a High-grade Iron and a Ductile Cast Iron.*

Type of iron.	Matrix structure.	Izod impact value (ft.-lb.) on unnotched test-piece.	
		0·450 in. dia.	0.798 in. dia. (B.S. 1349).
Ni-Tensyl	Pearlitic ..	6	26
Ductile cast iron ..	Pearlitic ..	12	105
" " ..	Ferritic ..	52	Unbroken 120 +

Quenching and tempering treatments, and suitable alloying to influence the matrix structure, can raise tensile strength to 60 tons per sq. in. or more. Hardness can, of course, be varied according to the composition chosen and the heat-treatment applied; it can range from as low as 150 Brinell in fully ferritic structures to 500 Brinell or more in alloyed irons which have been quenched and tempered. The normal "as-cast" pearlitic irons have hardnesses in the range 220 to 300 Brinell and are freely machinable.

The effect of section thickness is slight, and even in masses of 6 in. dia. the tensile strength in the interior will be found to be about 90 per cent. of that of a 1-in. dia. test-bar poured in the same metal.

Fracture

The characteristic facetted fracture of flake-graphite iron is familiar to foundrymen and to most engineers. Wide variation in appearance is possible, from the coarse structure of sand-cast pig-iron to the fine-grained fracture of rapidly-cooled castings or that of castings of special composition. Nevertheless, over that broad range, the fractures remain crystalline. Those of the modified-graphite irons, however, are distinctive. They appear to be structureless, and resemble the fractures of high-carbon steels (see Fig. 8). A further empirical distinction between flake-graphite

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and modified-graphite irons is provided by the fact that whereas the former give a dull sound when struck the latter emit a ringing tone.

Base Composition

Both hyper- and hypo-eutectic compositions are suitable for treatment by the magnesium process. The best range of carbon content is 3.2 to 3.8 per cent., but irons of compositions falling outside these limits

FIG. 6.—GRAPHITE SPHEROID. UNETCHED ×1,000.

can readily be treated. In conventional irons, especially the un-alloyed grades, control of silicon content to narrow and, generally, low limits is usually necessary. In the case of magnesium-treated irons it is desirable to maintain silicon relatively high, and limitation is required only to ensure that strength and ductility are not lowered. The silicon content of the untreated iron normally ranges from 1½ to 2½ per cent. Manganese may be present in the quantities normally encountered, but for the best combination of properties, and particularly for the most ready development of ferritic structures with maximum ductility, manganese should be low, certainly not above 0.5 per cent., and preferably 0.3 per cent. or less.

Very Low Sulphur not Necessary

In the case of sulphur and phosphorus, recommended compositions become more definite. Magnesium is an efficient de-sulphuriser, and though the treatment can be applied successfully to irons with sulphur contents up to the highest levels normally encountered on cupola melting, the amount of the addition is less when lower-sulphur irons are treated. Prior de-sulphurisation may be practised, but satisfactorily-low sulphur contents can usually be ensured economically by selection of suitable materials. Whilst the presence of phosphorus does not prevent the formation of spheroidal graphite, there is some interference, especially at levels above 0.5 per cent., and best mechanical properties are exhibited by low-phosphorus irons. Table III shows the tensile strength, impact-resistance, elongation value and hardness, in the as-cast and the annealed conditions, of a spheroidal-graphite cast iron of low phosphorus content.

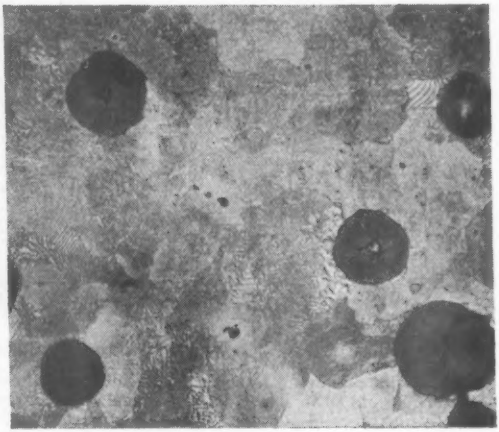

FIG. 9.—STRUCTURE OF THE AS-CAST SPHEROIDAL-GRAPHITE CAST IRON (TABLE III). ETCHED ×250.

TABLE III.—*Mechanical Properties of a Ductile Cast Iron, in the As-cast Condition and After Annealing for 4 hrs. and for 8 hrs. at 725 deg. C.*

	As cast.	Annealed.	
		4 hrs.	8 hrs.
Tensile strength, tons per sq. in.	44.6	31.5	30.3
Yield point, tons per sq. in.	33.0	20.1	20.0
Elongation, per cent. on 2 in.	3.0	13.5	15.0
Reduction of area, per cent.	3.6	12.0	14.8
Izod impact, ft. lb. (0.450 in. dia. unnotched)	12	32	52
B.H.N.	274	170	162

FIG. 7.—A BAR, 8 IN. BY 1 IN. BY ¼ IN., MACHINED FROM A CLOVER-LEAF BLOCK, AND TWISTED AT ROOM TEMPERATURE, AFTER SUB-CRITICAL ANNEALING. APPROXIMATELY ⅔ SIZE.

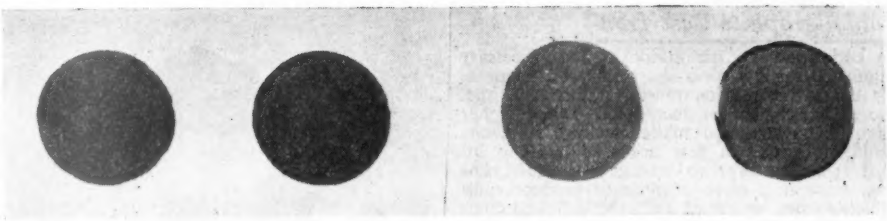

FIG. 8.—FRACTURES OF (LEFT TO RIGHT) COARSE-GRAINED AND FINE-GRAINED FLAKE-GRAPHITE IRONS, SPHEROIDAL-GRAPHITE IRON AND HIGH-CARBON STEEL. APPROXIMATELY FULL-SIZE.

The etched structure of the material tested is shown in the as-cast condition in Fig. 9. Fig. 10 shows the same iron after annealing for 8 hrs. at 725 deg. C.

With increase in phosphorus content, the brittle phosphide eutectic is formed in increasing amounts and this causes some reduction in tensile strength and marked lowering of impact and elongation values, even after heat-treatment to give fully-ferritic structures. For example, with 0.25 per cent. phosphorus

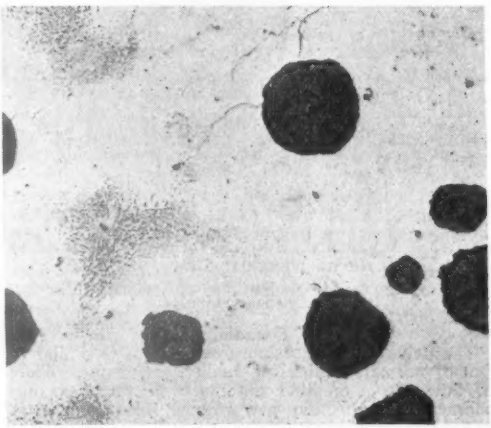

FIG. 10.—STRUCTURE OF THE SPHEROIDAL-GRAPHITE CAST IRON ANNEALED AT 725 DEG. C. FOR 8 HRS. (TABLE III). ETCHED ×250.

present, the elongation of annealed specimens is normally about 10 per cent. and in 0.5 per cent. phosphorus irons the value is about 5 per cent.

From all the foregoing it is evident that the magnesium process can be applied to a wide range of compositions; the final matrices may be ferritic, pearlitic, acicular, martensitic or austenitic, as desired.

Annealing

In the blackheart-malleable process, the casting is initially of white iron, that is to say, there is no graphite present, and the subsequent annealing treatment consists of three consecutive stages:

(*a*) Heating to about 900 deg. C. and holding at that temperature while the massive cementite decomposes to form nodules of temper carbon.

(*b*) Cooling to the pearlite change point, about 730 deg. C. During this stage the carbon rejected from solid solution is deposited as graphite on the existing nodules.

(*c*) Holding just below the critical temperature, to allow breakdown of pearlite to ferrite and graphite.

The structure which exists at completion of stage (*b*) of the blackheart malleablising process is obtained, in spheroidal-graphite iron, in the as-cast condition, with the advantage that the graphite is present in spheroids and not in ragged nodules. Therefore, to

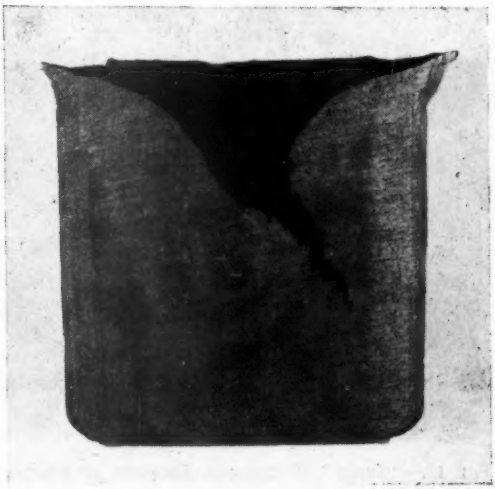

FIG. 11.—OPEN "PIPE" IN FEEDER HEAD OF CLOVERLEAF BLOCK. APPROXIMATELY HALF-SIZE.

Spheroidal-graphite Cast Iron

produce completely ferritic matrices, it is necessary to maintain the castings for a short time at a temperature just below the pearlite transformation point and, since the silicon content of ductile cast iron is higher than that of conventional malleable cast iron, the time required is only a few hours. In many instances it is unnecessary to arrange for subsequent annealing, since it is often possible to produce sufficiently-ductile irons by use of a suitably-adjusted composition, coupled with controlled conditions of cooling.

Melting

Any type of furnace may be employed. When the ordinary cupola is used, the charge materials should be so selected as to ensure that the sulphur content of the iron, as tapped, will be as low as is economically possible. Electric and crucible furnaces of all types are very suitable. Rotary furnaces are satisfactory also, although some are at a disadvantage because of the liability to heavy loss of carbon during melting.

The basic-lined cupola is probably the ideal melting unit for producing ductile cast iron, since it provides high-carbon, low-sulphur iron, even from charges containing substantial proportions of steel scrap. The higher cost of the lining materials is offset by savings in addition alloy, and it is probable that the development of the new-process irons, allied with improvements recently made in basic refractories, will greatly increase the application of this type of cupola.

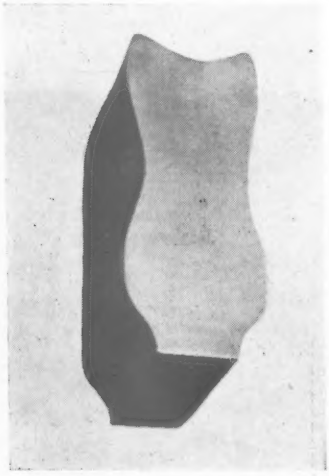

FIG. 12.—"SINKS" IN CENTRAL SECTIONS OF FEEDER HEAD FROM KEEL BLOCK. APPROXIMATELY ONE-THIRD SIZE.

(Courtesy of Sheepbridge Stokes Centrifugal Castings Company, Limited)

FIG. 13.—A VERTICAL, SAND-CAST LINER 9 IN. BORE BY 31 IN. LONG, WEIGHING 5 CWT. AS-CAST.

(Courtesy of Sheepbridge Stokes Centrifugal Castings Company, Limited)

Founding

The fluidity of magnesium-treated irons is similar to that of normal, engineering-quality, grey irons. There is, however, a notable difference in the shrinkage characteristics of the new-process irons, which is evidenced by formation of deep "pipes" in the feeders (Fig. 11) and "sinks" on the external surfaces of inadequately-fed sections (Fig. 12) as distinct from the internal porosity, which is liable to be found in flake-graphite irons. These characteristics facilitate inspection of castings, and improvement, where necessary, of the gating and feeding systems. Wherever practicable, the metal should be passed through the feeders into the castings. Well-designed off-feeders of open-top, closed-top, or atmospheric types are very effective and ironfoundries which successfully manufacture pressure-tight castings, such as valve bodies and the like, will find that sound castings can be produced in spheroid-graphite iron without undue difficulty. Figs. 13 and 14 show castings, complete with gates and feeders, produced in a British foundry.

FIG. 14.—A DISC CASTING OF 15 IN. DIAMETER WITH FEEDER HEAD OVER HEAVY CENTRAL BOSS.
(Courtesy of Sheepbridge Stokes Centrifugal Castings Company, Limited)

Practical Trials

In the course of 1948, following much exploratory work on a laboratory scale, trials were begun under normal British foundry conditions. These have progressed successfully and have demonstrated that the magnesium treatment can readily be applied, on a production scale, to metal melted in the cupola and in rotary, crucible and electric furnaces, and that castings of diverse types, for a variety of purposes, can readily be made. Much of the work has been carried out on cupola-melted cast iron satisfying the requirements of B.S. 1452, Grade 17, and this has demonstrated that iron of this type, which is in regular use in the majority of foundries for production of miscellaneous engineering castings of good quality, can be treated to give spheroidal-graphite structures. This meets the need of many foundrymen who will wish to make conventional flake-graphite irons or ductile cast iron at will, with no change in procedure other than that carried out in the ladle. Table IV contains results obtained by three consecutive treatments carried out on cupola-melted high-duty cast iron.

These figures indicate the reliability of the procedure and the consistency of the results obtainable. Fig. 15 shows the structure of a test-bar from S-S 11 material.

Other Properties

The engineer is interested in other properties and characteristics of metals, such as:—fatigue strength, elastic properties, damping capacity, machinability, and resistance to wear, heat and oxidation. Morrogh

TABLE IV.—*Results from Treating Flake-graphite Cast Iron in the Ladle.*

Treatment reference :—	S-S. No. 11.	S-S. No. 12.	S-S. No. 13.
Percentage compositions (as cast)—			
Total carbon	3.15	3.25	3.20
Silicon	2.67	2.64	2.61
Manganese	0.60	0.65	
Sulphur	0.006	0.006	0.006
Phosphorus	0.09	0.10	
Nickel	2.11	2.04	2.01
Mechanical properties (as cast)—			
Tensile strength (tons per sq. in.)	45.4	41.6	44.4
Hardness (Brinell No.)	286	290	283

and Grant[3] have published information under such headings, based on determinations made on specimens of nodular-graphite cast iron produced by treatment with cerium. Although their findings require modification in some respects when considering magnesium-treated irons, they are broadly applicable to the whole class of the new-process irons.

It has been pointed out[4] that whereas flake-graphite irons do not follow Hooke's law, ductile cast irons behave like steel, in that there is proportionality between stress and strain up to high levels of stress. Moreover, whereas the modulus of elasticity of flake-graphite irons varies over the range from 12 to 20 million lb. per sq. in., that of spheroidal-graphite iron is consistently around 25 million lb. per sq. in. In other words, ductile cast irons are elastic in the generally-accepted sense and are much more rigid than flake-graphite irons.

As would be expected, the replacement of flake by spheroidal-graphite and the consequent elimination of a multitude of stress-raising features and internal

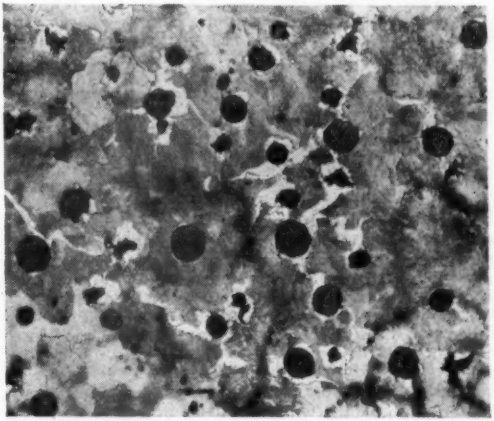

FIG. 15.—STRUCTURE OF TEST-BAR FROM TREATMENT S-S. NO. 11. (TABLE IV). ETCHED ×100.
(Courtesy of Sheepbridge Stokes Centrifugal Castings Company, Limited)

notches, gives, in the new-process irons, fatigue strengths which are very much higher than those of flake-graphite irons. The fatigue ratio of magnesium-treated iron is consistently about 45 per cent. of the tensile strength, whether the material is in the as-cast or the heat-treated condition. The elimination of flake graphite, however, causes the damping capacity of ductile cast irons to be much lower than that of flake-graphite iron and to approach the values characteristic of steel.

Machinability and Wear Resistance

In this age of mass production, machinability is a very important property. The as-cast spheroidal-graphite irons machine as freely as do flake-graphite irons of the same hardness, and give smoother surfaces. In the as-cast condition the material cuts with a broken chip but, when annealed, it produces a continuous chip somewhat similar to that of steel. Resistance to wear is difficult to determine with accuracy and reliable data will be built up only on the results of trial under various conditions of service. It is probably sufficient to repeat that the hardness of spheroidal-graphite cast irons can be varied, at will, over a wide range. It is, therefore, logical to expect that, by suitable adjustment of composition or heat-treatment, or both, it will be possible to provide magnesium-treated cast irons which will show excellent resistance to wear under any conditions for which graphitic cast irons would be considered.

When exposed to high-temperature conditions flake-graphite irons are usually attacked by penetration of oxidising gases along the graphite flakes. With the presence of spheroidal graphite improved performance would be expected. Results already available strengthen this opinion, but it is preferred to make no claims until there is more evidence available from service tests.

Applications

As will be appreciated from study of the range of properties quoted, the field of application of the ductile cast irons is very wide. The main users will probably be the motor, agricultural, rolling-stock and general-engineering industries. The individual potential applications are far too numerous to detail; the most obvious include many types of castings at present made in malleable cast iron or in carbon steel. Other applications will be developed as engineers become familiar with the properties obtainable and as the results of service tests become known. Such tests are already in progress. As typical of parts for which spheroidal-graphite cast iron may prove to be especially suitable, Fig. 16 shows a finish-machine clutch-plate casting of experimental design.

Development

The publication of information will, inevitably, be subject to some restriction until the Patent applications filed by the Mond Nickel Company, and its associates, are granted. Meanwhile, under cover of patents pending in all industrially-important countries of the world, the commercial production of castings in magnesium-treated iron is proceeding in licensed foundries. The outlook is one of constantly-expanding output and rapid progress with ductile iron castings.

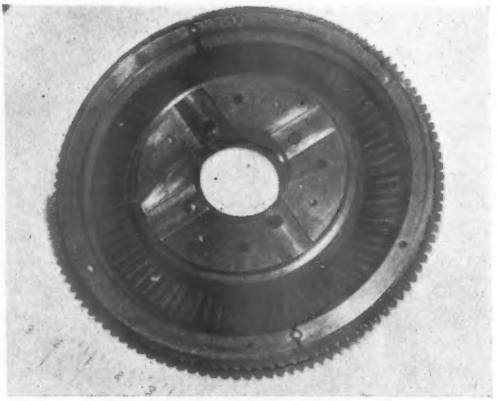

FIG. 16.—A FINISH-MACHINED, CLUTCH-PLATE CASTING OF EXPERIMENTAL DESIGN.

(Courtesy of Sheepbridge Stokes Centrifugal Castings Company, Limited, and Humber, Limited.)

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[2] "The Production of Nodular-graphite-structure Cast Iron," H. Morrogh and W. J. Williams. *Jnl. Iron and Steel Inst.*, 1948, CLVIII, 306-322.

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[4] "Ductile Cast Iron—a New Engineering Material," A. P. Gagnebin, K. D. Millis, and N. B. Pilling. *Iron Age*, 1949, CLXIII, Feb. 17, 77-83.

[5] "Belgian Research Advances Nodular Graphite Theory," A. De Sy. *Amer. Foundryman*, 1949, XV, 55-62.

[6] "Producing Nodular Graphite with Magnesium," C. K. Donoho. *Amer. Foundryman*, 1949, XV, 30-37.

[7] Discussion on "Production of Nodular-graphite-structure Cast Iron" (item 2 above). FOUNDRY TRADE JOURNAL, 1948, LXXXIV, 463.

Some Notable Aluminium-alloy Castings*

Details Special Production Methods

By A. R. Martin, B.Sc., A.R.S.M.†

(*Continued from page* 305.)

Further Examples of High-strength Gravity Die Castings

As an example of a component, well designed as a casting, the aircraft-engine support bearer in DTD 300 alloy, now to be described, is almost ideal Although it is a heavy casting of thick section, uniformly high tensile properties were obtained throughout by attention to the die coating technique. The importance of correct coating technique is brought out later.

The toolholders, cast in DTD 304 alloy to take advantage of the higher proof stress of this alloy over DTD 300, illustrate the more straightforward sort of casting that may be made in a gravity die in an extremely hot short alloy.

Aircraft-engine Support Bearer

This casting was developed in the early days of the "Sabre" engine and, as its name suggests, it locates on the airframe and the front of the engine is bolted to it. This must obviously place heavy fluctuating stresses on the component in service. Originally it was made as a sand casting, but increased production demands warranted the construction of a die and, as with the rudder pedal just described, the successful sand casting technique was retained in the die design. The over-all dimensions of the casting were 27½ in. × 6 in. × 8 in. high and the weight fully fettled was 26 lb.; as-cast, the component weighed 64 lb. Ample radii (normally 0.6 in. or more) were allowed on all corners, and the nominal taper of three degrees was increased to seven degrees on deep-drawn flanges. Changes of section were gradual and the largest masses of metal were well placed to allow adequate feeding.

The casting was cradled on the base of the die and the cores forming the bosses, which were fastened to the airframe, were withdrawn into the base. The two die sides carried integrally all the cores for producing the form of the flanges and bosses. These were not independently drawn. At first, the central riser (seen in Fig. 15) was omitted, and this resulted in severe cracking at the apex of the casting. When this riser was added, the castings produced were by external inspection and by radiographic examination proved to be sound. The die was heavily coated but some adjustment of the thickness of coating was necessary to produce a uniformly sound casting. The die was gated at one end. It was tilted for pouring and was lowered as pouring progressed. Shortly after completion of pouring, the cores were withdrawn and after the risers had solidified a further waiting period was allowed before the die was opened and the casting withdrawn. This necessarily resulted in a low rate of production; about 50 to 55 castings per shift being produced. After heat-treatment, visual inspection was supplemented by the "chalk" test for cracks. A radiographic technique involving eight shots completed the inspection procedure. Fig. 16 gives a good impression of the finished casting.

Die-coating

To illustrate the importance of correctly coating the die, the following tensile properties were obtained from test-pieces cut from a casting coated uniformly all over:—

Position.	Ultimate tensile stress, tons per sq. in.	Elongation per cent.
Lower flange, junction of web ..	11.4	2
Lower flange, outside edges ..	23.8	38
	23.8	38
	24.0	40
	23.6	25
Bolting face, below riser ..	22.6	31
	22.2	28

FIG. 16. — AIRCRAFT-ENGINE SUPPORT BEARER, FINISHED CASTING.

*Presented at the Cheltenham Conference of the Institute of British Foundrymen.

†Chief Metallurgist, Northern Aluminium Company, Limited, Casting and Forging Division, Birmingham.

Some Notable Aluminium-alloy Castings

FIG. 17.—GROUP OF TOOL-HOLDER AND PULLEY CASTINGS IN DTD 304 ALLOY.

Heat extraction from the centre of the flange was increased by removing the coating in this region. Properties then obtained from a casting were:—

Position.	Ultimate tensile stress, tons per sq. in.	Elongation per cent.
Lower flange, junction of web ..	19.4	13
Lower flange, outside edge ..	20.6 21.0	15 16

These properties are not as good as the average properties obtaining in the first case, but they are nevertheless of a high order and reasonably uniform.

This example does illustrate forcefully the need for a careful development of the casting technique, backed by extensive tests, in the case of high strength alloys. Also the need for constant supervision of details when the job is in production is evident.

Toolholders for Large Capstan Lathes

These castings were developed before world war II in an attempt to reduce the man-handling of large turrets by reducing their weight. Replacing iron or steel by aluminium alloys always carries with it the necessity for a re-adjustment in design to allow for the lower modulus of elasticity. In applications such as this where rigidity is a first consideration, much thicker sections must be used at points where flexing takes place. Even so, these castings were half the weight of their equivalents in iron or steel.

FIG. 18.—LARGE TOOL-HOLDER CAST IN DTD 304 ALLOY.

Like the engine support bearer previously described, these parts were designed as castings having due regard to the characteristics of the alloy. Ample radii were provided on all corners and sudden changes of section were avoided. The two smaller castings in Fig. 17 are 12¼ in. by 6¼ in. by 4½ in. (weighing 9½ lb. fully fettled) and 9½ in. by 7 in. by 2½ in. weighing 6½ lb. (left- and right-hand side of the group respectively). Pulley wheels ranging from 3½ in. dia. by 1½ in. thick to 7½ in. dia. by 2 in. thick are included in Fig. 17. In Fig. 18 one of the larger range is shown; this measures 12 in. by 7½ in. by 8 in. and weighs 18 lb. when fully fettled.

The alloy was produced to the specification requirements of DTD 304, namely:—

Chemical Composition.—Cu, 4.0-5.0 per cent.; Si, 0.25 per cent. max.; Fe, 0.25 per cent. max.; and Ti, 0.25 per cent. max.

Tensile Properties (DTD-type sand-cast test-pieces). —Ultimate tensile stress 18 tons per sq. in. and 4 per cent. elongation; the 0.1 per cent. proof stress to be not less than 14 tons per sq. in.

Die Construction

The two-piece dies for the two smaller toolholders were designed to produce the castings with their longest axes vertical and heaviest sections uppermost. Gating was at the lowest point of the castings. As in the case of castings produced in DTD 300 alloy, the dies were heavily coated and the steel core pins were quenched in water on withdrawing from the die, after a casting had been poured. These dies were not by any means trouble free, however, and the larger component is now cast in what is to all intents and purposes an open-top mould. The shape facing front in Fig. 18 was cradled in the base of the die. Two die sides complete the form of the casting and allow

for a head of metal of about 3 in. over the flat face of the casting, which is at the rear of the illustration.

Although the alloy does not suffer from the oxidation troubles encountered in the foundry with DTD 300 alloy, all the precautions regarding cleanliness, rigid temperature control and melting practice were still applied to ensure production of the best possible castings. Crucible melting was preferred and additions of titanium were made to the charges of ingot and scrap to maintain a percentage satisfactory for the production of a fine grain.

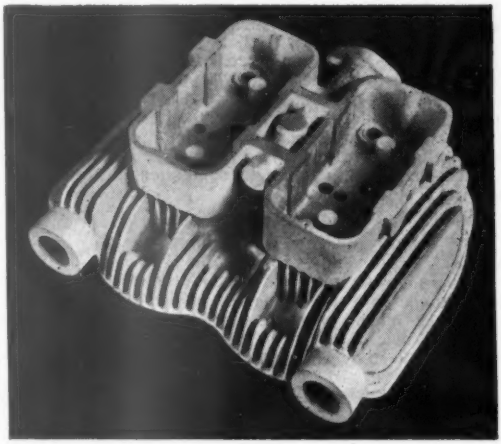


FIG. 19.—CYLINDER HEAD FOR A 4-CYL. MOTOR-CYCLE, CAST IN SAND IN DTD 272/276 ALLOY.

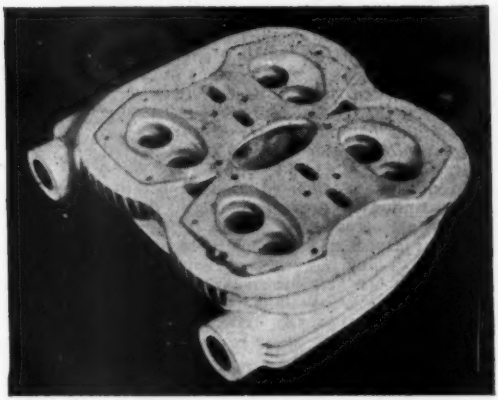


FIG. 20.—UNDERSIDE OF THE MOTOR-CYCLE CYLINDER-HEAD CASTING SHOWN IN FIG. 19.

FIG. 21.—WIRE SPRIGS TO STRENGTHEN THE FINS OF THE MAIN BLOCK CORE ARE BEING PLACED IN POSITION. A COMPLETED CORE IS SHOWN ON THE LEFT.

Some Notable Aluminium-alloy Castings

Casting and Subsequent Treatment

The castings were poured slowly at a temperature of 670 to 690 deg. C. to minimise the risk of cracks. The larger component was poured through the riser and the mould filled to within 1 to 1½ in. of the top. The riser was then immediately filled with fresh hot metal. As with the high-strength die castings previously described the rate of production was low and about 40 castings per shift was all that could be expected.

Heat-treatment was carried out in electrically-heated, forced-air circulatory furnaces of the vertical pit type. Details of the treatment are as follow:—

Solution: 12 hours at 535 deg. C.
Quenching: Water at 50-60 deg. C.
Ageing: 8 hours at 130 deg. C.

In spite of the high solution temperature employed, no precautions to prevent sagging or distortion of these castings are necessary.

Visual inspection is supplemented by critical examination with a low power magnifying glass to detect the presence of fine hair-line cracks which tend to occur on sharp corners. A small percentage of the castings are machined in the bores as a check on internal soundness.

AIR-COOLED CYLINDER-HEAD CASTINGS

Motor-cycle Cylinder Head

An excellent impression of the complexity of air-cooled cylinder-head castings may be gained from Figs. 19 and 20. Not only is the head heavily finned but there are in addition inlet and exhaust manifolds to each combustion space and two push-rod guides to each of the rocker boxes. This component is jig machined and on the first operation it is held by the outside edges of the four combustion spaces. These must be positioned to an accuracy of ±0.020 in. The location of the rocker-box cores is also important owing to the extreme thinness of the walls. The over-all dimensions of the castings are 12 in. × 12 in. × 4½ in., and the weight, when fully fettled, is 14 lb.

A 5 per cent. silicon, 1¼ per cent. copper, ½ per cent. magnesium alloy was chosen for the production of this casting. The desirable characteristics of this alloy have already been enumerated. It is produced to the composition requirements of specifications DTD 272/276, *viz.*: Cu, 1.0 to 1.5 per cent.; Mg, 0.4 to 0.6 per cent.; Si, 4.5 to 5.5 per cent.; Fe, 0.6 per cent. max., and Ti, 0.25 per cent. Neither of the heat-treatments laid down by the specifications is carried out but, instead, a special stress-relieving treatment is given to prevent growth of the castings and to minimise subsequent distortion in service.

Moulding Equipment

The pattern and core box equipment is also cast in DTD 272/276 alloy, since it is a harder-wearing material than BS 2L33. All the core box equipment had to be made with a high degree of precision. Due to the strict dimensional tolerances obtaining on the finished article, no filing or rubbing of the cores could be tolerated—they had to fit into place correctly first time or not at all. The core box for producing the main block core is seen in Fig. 21, with a finished core turned-out on to its carrier on the left-hand side. The core-maker is placing some of the numerous wire sprigs into position prior to ramming-up the cores. The group of fifteen cores required to build up the mould is shown in Fig. 22.

The combustion spaces are cored out by shaped iron chills. Iron chills are also incorporated in the rocker-box cores and the cores forming the push-rod guides are mounted in pairs on iron chills and the inside edges of these are arranged to carry stout iron rods embedded

FIG. 22.—COMPLETE SET OF FIFTEEN CORES FOR THE MOTOR-CYCLE CYLINDER-HEAD CASTING.

in the sand—also acting as light chills (also shown in Fig. 22).

Sand for Cores

Sea sand forms the basis of the mix used for all the cores. Additions are made of 1 to 2 per cent. clay (added as a quarried sand containing 10 per cent. clay) and 2 per cent. cereal binder, to give sufficient green strength to hold up the thin fins during baking, and of 1½ per cent. linseed oil to give high baked strength. The properties aimed at with this mix are:—A.F.S. permeability, 100 to 150 units; baked compression strength, 450 to 650 lb. per sq. in.; and green compression strength, 3 to 5 lb. per sq. in.

The two-part mould is rammed up in a sand consisting of 35 to 45 per cent. quarried sand (10 per cent. clay) and the balance is sea sand. This sand is re-milled, after use, with water and additions of either quarry sand or sea sand to maintain the following properties:—A.F.S. permeability, 50 to 70 units; green compression strength, 4 to 7 lb. per sq. in.; and moisture, 5 per cent. max.

The drag flask is rammed up on a pattern plate and carries two dowells which serve to locate the plate and also to locate the main cores which carry moulded-in steel bushes. The plate carries the runners, the locating impressions for the four combustion-space chills and locating impressions for the push-rod guide cores. In Fig. 23 the partly cored-up mould is shown and in this illustration the main block core, with the rocker-box cores in place, is standing on the pattern plate on which the cope flask is rammed up. Fig. 24 shows in more detail a view of the initial coring-up operation. The combustion-space chills, lightly sprayed with die-coating, are just visible and one of the locating dowells may be seen in the far left-hand corner. The two sprues are best seen in Fig. 23. The runners are split and the casting is gated at four points on the flange. A riser provides feed metal for the central group of bosses and four risers are placed one on each of the lugs on the outside of the rocker boxes.

Metal Preparation

Charges of ingot are melted in crucible furnaces and transferred to bale-out furnaces for modifying treatment. The temperature is adjusted and de-gassing is carried out with nitrogen as the heat of the furnace

FIG. 23.—PARTLY CORED-UP MOULD.

FIG. 24.—INLET MANIFOLD CORE BEING PLACED IN POSITION. THE CHILLS FOR FORMING THE COMBUSTION SPACES ARE JUST VISIBLE UNDER THE MANIFOLD CORES.

Some Notable Aluminium-alloy Castings

FIG. 25.—AIR-COOLED AIRCRAFT-ENGINE CYLINDER-HEAD CAST BY THE EVACUATED-DIE PROCESS IN "Y" ALLOY.

brings the metal to the required pouring temperature of 750 to 760 deg. C.

Heat-treatment and Inspection

As a result of many years of experience with cylinder heads and castings of various types to work at elevated temperatures, the following heat-treatment has been standardised for use with this material:—

Solution: 8 hours at 525 deg. C.
Cooling: To take place in still air.
Stress relief: 9 hours at 200 deg. C.
Final cooling: In still air.

This treatment induces a Brinell hardness (1,000 Kg/10 mm.) of 80 to 90 which is adequate for most machining operations.

Visual inspection is supplemented by a "leak" test in which paraffin is poured into the rocker boxes and allowed to remain for some time, after which the valve ports, etc., are examined for signs of penetration.

The dowels in the drag flask are frequently checked by a jig to make sure that they have not become bent. The head itself is jigged on the outside edges of the combustion spaces, and the position of the exhaust and inlet manifolds are checked by templates, as also are the positions and depth of the rocker boxes.

Air-cooled Aircraft-engine Cylinder-head

An air-cooled aircraft cylinder-head, next to be considered, is made in "Y" alloy, and is shown in Fig. 25. It measures 7½ in. × 6½ in. × 6½ in. high and weighs 9 lb. when fully fettled. The fins are 1.5 mm. thick at the tip with a pitch of 5.2 mm.

Evacuated-die Casting Process

The evacuated-die process was first patented by the Bruneau Freres concern in France for the production

FIG. 26.—GENERAL CONSTRUCTION OF THE PLATE-TYPE EVALUATED DIE FOR THE CYLINDER HEAD SHOWN IN FIG. 25.

FIG. 27.—AIRCRAFT ENGINE HEAD CASTING BEING REMOVED FROM THE DIE. THE CRADLE WHICH LOCATES THE CORE IN THE DIE IS USED TO HANDLE THE CASTING.

of finned cylinder-heads for Gnôme-Rhône. In principle, the die is built up, where the fins occur, from banks of blades. These blades are in contact at the fin tips, and air is drawn from between the blades. The process is not analogous to pressure casting in reverse, since the metal is not drawn into the die by the vacuum but flows normally under the influence of gravity. As the level of the metal rises in the die, pairs of blades are shut off from the atmosphere and the air between them is promptly withdrawn, helping the metal to run to the extremity of the fin without the tendency to misrun (due to an air "cushion") or to entrap air bubbles in the fin.

Construction

The combustion chamber, inlet and exhaust valves and guides are surrounded by fins, the maximum depth of which is 100 mm. Four horizontal banks of plates surround the core, which is located in a carrier in the top of the die, the combustion space being uppermost. Fig. 26 gives an idea of the general construction of the die which, although still in use, was made some years before world war II. The vacuum connections are seen at the right-hand side; two of the aluminium cover plates which connect the banks of blades to the evacuating pumps, the rollers on which the die tilts and the cradle which carries the core may also be seen. In Fig. 27 a casting is being removed from the die; this affords a view of the position of the risers. The central riser extends into the combustion space to feed the bridge between the two valve-seatings. One of the banks of blades may be seen withdrawn from the die. The base of the die is an iron casting 28 in. × 21½ in. × 17 in. deep and carries the impression of the plate forming the base of the rocker box. The four vacuum manifolds, 1¼ in. diam., are cored-out in this casting. Mounted on this are four hollow pillar castings; a ring casting on the top of these makes the whole into a rigid assembly. The width of the blades is not the same from top to bottom of the stack, but at intervals they are stepped down in size towards the base of the die, so as to reduce the weight which would otherwise bear on the lower blades. In addition, the heads of the blades are not all at the same distance from the die side. This provision ensures that, when the hand levers are used to prise the blades out for withdrawal, adjacent blades are not withdrawn simultaneously, but one is allowed to move before the other.

The blades are machined from chrome-tungsten-molybdenum steel sheets, and the process by which these sheets are prepared to render them free from internal stresses, which would otherwise cause them to warp in service, is most involved. Three air channels are milled on the top side of each blade. These are 15 mm. wide × 0.007 in. deep at the fin tip, tapering to 0.002 in. deep in 5 mm. and continuing at this depth to the head of the blade. The taper on the fin section is two degrees.

The core is made up in a sand similar in composition to that used in the production of the motor-cycle cylinder-head cores.

Metal, Pouring and Treatment

"Y" alloy is produced to the composition requirements of specification BS L.35 as follows: Cu, 3.5 to 4.5 per cent.; Mg, 1.2 to 1.7 per cent.; Si, 0.6 per cent. max.; Fe, 0.6 per cent. max. (Si + Fe, 1.0 per cent. max.); Ni, 1.8 to 2.3 per cent.; Pb, 0.5 per cent. max.; Sn, + Zn, 0.1 per cent. max.; and Ti, 0.20 per

Some Notable Aluminium-alloy Castings

cent. max. As with the cylinder head previously described, a stress-relief heat-treatment is applied.

Metal is melted in crucible furnaces. Titanium hardener is included in the charges to maintain a suitable amount to ensure a reasonably fine grain size. The metal is transferred to the bale-out holding furnaces, the temperature is adjusted and de-gassing is carried out, either with nitrogen or with proprietary hexachlorethane de-gasser tablets. The die is tilted for the commencement of the pouring, but is quickly restored to a horizontal position as pouring proceeds.

The stress-relief heat-treatment applied to these castings is as follows:—

Solution: 8 hours at 515 deg. C.

Cooling: to take place in still air.

Stress-relief: 8 hours at 230 deg. C.

Final cooling: in still air.

This treatment induces a Brinell hardness (1,000 kg./10 mm.) of 85 to 100.

As a supplement to visual inspection, the castings are "leak" tested by stopping-off the ports and combustion space and applying air pressure of 30 to 80 lb. per sq. in. internally and immersing the casting in a tank of water. Radiographic examination of the combustion space is carried out to detect the presence of entrapped air or oxide between the valve seatings. The core is checked by means of a jig before it is used to check sagging of those portions forming the ports. The correct location of the cradle carrying the core is checked by an inspector at the start of each day's production, since the wall thickness of the ports does not allow for any misalignment of the core.

Conclusion

High-strength aluminium alloys do not possess good casting characteristics. They are admittedly difficult to handle in the foundry, and the Author has endeavoured to show how these difficulties have been overcome, leading to the successful production of castings which are able to withstand heavy, fluctuating loads.

The means whereby these difficulties have been overcome may be summarised as:—

(*i*) Using a metallurgical knowledge of the alloys.

(*ii*) Developing a casting technique in the light of extensive tests on the quality and uniformity of samples of the product.

(*iii*) By strict supervision of details during the actual production.

The designing of unusual patterns, core box equipment and dies, whether it be to produce unusually complicated castings with better than normal dimensional accuracy, to counter adverse casting characteristics, to prevent excessive die distortion or to run thin, closely-spaced fins on a die casting, is essentially the realm of the practical man. Some of the features described in the Paper represent worthwhile contributions to the art.

The Author wishes to thank his several colleagues who have assisted in collecting data and illustrations and to express his appreciation to the management of the Northern Aluminium Company for permission to publish this Paper.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

A CORRECTION

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—We notice in the issue of your journal of August 25, 1949, page 246, that Lord Forrester is referred to as being a director of (amongst other companies) South Wales Metal Refiners (1941), Limited. Will you please note that this company changed its name in 1944 to Enfield Rolling Mills (Aluminium), Limited. In passing we should also point out that Enfield Cable Works, Limited, is now Enfield Cables, Limited.—Yours, etc.,

T. FRYER,
Secretary.

Enfield Rolling Mills (Aluminium), Limited,
Brimsdown, Enfield, Middlesex.
September 8, 1949.

THE RAILWAY EXECUTIVE has established a unified staff-suggestions scheme which, like those operated by the former main-line companies, has the object of encouraging the co-operation of the staff in progress and development.

Publications Received

Alar Data Sheet. Published by Alar, Limited, 3, Albemarle Street, London, W.1.

The great usefulness of these data sheets is that within a minimum of space a maximum amount of information is given as to cast-aluminium alloys as related to specifications and trade names, and their engineering applications. Under the last heading are given the composition, minimum mechanical properties, casting characteristics, in addition to their uses. These data sheets are available to our readers on application to Mr. F. H. Smith, the development officer at Alar, Limited.

Classified Handbook of Members and their Manufactures. 1949 edition. Published by the British Engineers' Association, 32, Victoria Street, London, S.W.1.

Following the same pattern as last year's edition, this useful buyers' guide first lists alphabetically the members' names, addresses and lines of manufactures and similar information; then (again alphabetically arranged) there is a section of advertisements and finally a classified list of manufactures. The book, which now runs to 650 pages, is solidly bound and well produced.

Amsterdam International Foundry Congress

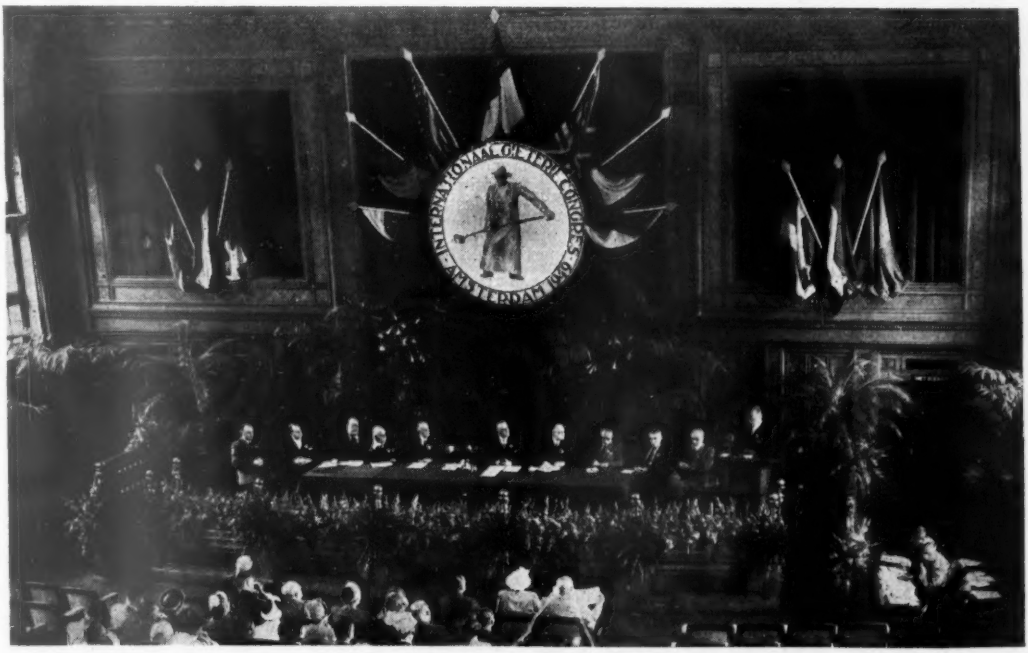
For the majority of the British delegation, the Congress began in the dreary atmosphere of Liverpool Street Station on a hot Saturday night. All there was to admire was the art of those long dead craftsmen who moulded those outsize pillars. The sea crossing was smooth and the passage through the Dutch customs a model of efficiency.

The British party included the following:—Mr. W. C. Ashton, Mr. J. G. Bailes, Mr. J. Blakiston, Mr. D. W. Brown, Mr. E. H. Brown, Mr. F. G. Butters, Mr. V. Delport, Mr. F. C. H. Evans, Mr. J. A. Evans, Dr. A. B. Everest, Mr. V. C. Faulkner, Mr. R. L. Handley, Mr. Barrington Hooper, C.B.E., Dr. J. E. Hurst, Mr. H. Jeans, Mr. G. L. Jones, Mr. B. B. Kent, Mr. A. Kirkham, Mr. E. Longden, Mr. T. Makemson, M.B.E., Mr. W. G. Mochrie, Dr. W. C. Newell, Mr. G. W. Nicholls, Mr. N. Rees, Mr. E. H. Salinger, Mr. E. Salt, Mr. D. Sharpe, Mr. D. H. Wood and Mr. R. Wood. Many of the delegates were accompanied by their wives and daughters.

The headquarters of the British delegation was the Hotel Victoria, Amsterdam, and on arrival there was an immediate distribution of the Congress tickets and booklets, under the expert supervision of Mr. Makemson. The rest of the day was given over to sight-seeing, terminating for quite a few in a visit to the circus.

The Opening Ceremony

At 10.30 a.m. on Monday, August 29, the Congress was opened at the Royal Institute for the Indies with



THE CENTRAL FIGURE AT THE TABLE IS MR. SPIES, THE PRESIDENT OF THE DUTCH FOUNDRY TECHNICAL ASSOCIATION. ON HIS LEFT ARE MR. T. MAKEMSON, M.B.E., MR. V. DELPORT, PROF. PISEK AND MR. LEONARD. AT THE ROSTRUM IS MR. R. DEPREZ, THE PRESIDENT OF THE INTERNATIONAL COMMITTEE. ON THE RIGHT OF MR. SPIES ARE DR. BALLAY, MR. V. C. FAULKNER, PROF. GJERDIEZEWSKI AND SIGNOR OLIVO.

Amsterdam International Congress

due ceremony. First, Mr. F. W. Spies, president of the Dutch Technical Foundry Association, welcomed the delegates in English, and then Mr. R. Déprez, as president of the International Committee of Foundry Technical Associations, replied in French on behalf of all the nations represented. Then Dr. A. Winsemius, General Director for Industrialisation, officially opened the Congress. He was followed by Dr. Dresden, who outlined something of the research and educational facilities at the University of Delft. Wisely, Mr. Spies then gave a short introductory address covering something of the history and activities of the Netherlands foundry industry. In the course of his remarks, he said:—In the early history of the ironfoundry in the Netherlands there were two distinct groups, namely, one which used pig-iron which was supplied from abroad, and the other which itself made the pig-iron produced from lean ores found in the Netherlands. The first group was mainly found in the west of the country, while the second group was situated in the east, the Veluwe, Achterhoek and Overijssel.

It was established that in the 16th century needles were made in the Low Countries. Unfortunately, it was not precisely known where the first needles were made and where the technique of the boring of the eye and the finishing with the file was in use. It was certain that this early Dutch steel technique existed in 1520. The first records as to the iron-producing industry (*i.e.*, dealing with an ironfoundry in Amsterdam in 1619) were from the first half of the seventeenth century. The products, which were produced in ironfoundries in those days were hand grenades, bombs and cannon balls, plus articles for household use such as pots and pans, stoves, grates, weights, ballast-weights for ships, and so on. The raw materials were bog-ore, charcoal and limestone.

During the excursions delegates would tread this historical ground. Places like Ulft and Doesburg, for instance, possessed a long history in the development of foundry technique. The names of Diepenbrock and Reigers, de Muinck Keizer and many others will call to mind the pioneering days of the Dutch foundry industry. Yet even earlier in the time of King Gustav Adolf of Sweden (1594-1632) it was the technical knowledge of the Dutchman Louis de Geer which brought the Swedish iron industry of Dannemora and Finspong to its considerable development. It was with much regret that he could only say that the father of Henry Bessemer was a Dutch typefounder!

At the time Bessemer was born, five or six ironfoundries were all that were necessary to supply the needs of the Netherlands. The daily wage for a helper was then tenpence, for a smelter and furnace worker, for a pattern-maker and moulder between one and one and a half guilders. Production and demand in the Netherlands were then still at a low level compared with the surrounding countries. About 1830, four ironfoundries produced approximately 1,500 tons of pig-iron per annum. In Belgium there were then 90 plants with a production of 55,000 tons yearly; in France, 222,000 tons, and in England, 633,000 tons. The German Customs Union produced in that period approximately 110,000 tons and the United States of America 155,000 tons a year.

Figures from the year 1836 showed that the same four ironfoundries produced 3,000 tons a year which was then about 75 per cent. of the Netherlands requirements. It was in this period that a beginning was made with the use of preheated blast in the blast furnace by Nering Bögel in Deventer. This resulted in fuel economy and improvement of quality and thus together with some import duties helped to protect the Dutch ironfoundries against the ever-increasing foreign competition (particularly the English). In this way it was possible to maintain production for some time, but during the years 1870-1890 the charcoal furnaces had to be shut down and the ironfoundries had to continue their business with cupola furnaces using imported pig-iron and coke.

In the years which followed there was a considerable growth in the non-ferrous foundries, engine works and enamelling technique.

Pig-iron Industry

However, the idea of making pig-iron themselves still persisted, but after Diepenbrock and Reigers in 1890 had blown out their last blast furnace, this dream came to an end and it was not until 1924 that a new and modern blast-furnace plant was erected by the Royal Dutch Blast Furnace and Steel Works at Ymuiden. This modern industry was no longer based on the very poor bog-ores from their own country, but depended entirely on imported iron ore. As a location for this industry the coast was chosen, with excellent communications by water to the sea and the hinterland.

The requirements of the Netherlands of foundry products before the second world war might be estimated at 160,000 tons a year. The production was then approximately 105,000 tons, so that 55,000 tons had to be imported. Sixty per cent. of the total was destined for the engineering and shipbuilding industry, 15 per cent. for household use, 5 per cent. for electro-technical purposes, 5 per cent. for the railways and 15 per cent. for various uses. Owing to increasing industrialisation, requirements in the near future might be estimated at approximately 200,000 tons a year.

Foundry Output

In the Netherlands there existed at the moment 98 foundries, which, in the year 1948, produced approximately 132,000 tons of foundry products. This, together with roughly 8,000 tons of steelfoundry products, made a total of iron and steelfoundry products of approximately 140,000 tons.

An impression of the size of these foundries was then given in the following statement for 85 foundries, 13 foundries being excluded:—

Eight foundries produced more than 4,000 tons each (1.47).

23 foundries produced between 1,000 and 4,000 tons (1.2).

ARN. J. D'AILLY, LORD MAYOR OF AMSTERDAM, ADDRESSING THE CONFERENCE.

15 foundries produced 500 and 1,000 tons (0.96).

26 foundries produced between 200 and 500 tons (0.89).

13 foundries produced less than 200 tons (0.65).

The figures, which are for 1948, give, between brackets, the production per workman in tons per month. In the above table the sand-spun pipe foundry of the Royal Dutch Blast Furnace and Steel Works at Ymuiden was not included. Had this been the case, then the first line would have read:—

Number of ironfoundries.	Production in tons in 1948.	Production in tons per man per month.
9	Each more than 4,000	2.52

Without the sand-spun pipe foundry the monthly production per workman as an average of all 85 foundries is figured at 1.23 tons, with the pipe foundry included, this would be 1.48 tons.

Non-ferrous Foundries

The non-ferrous foundries, which naturally were the oldest section of the foundry industry in the country, manufactured many products. These included tin and tin alloys, nickel and nickel alloys, zinc and remelted zinc, aluminium and remelted aluminium, silumin scrap, copper ingot and scrap, copper alloys (brass and bronze), German silver, cupro-nickel, manganese-bronze, aluminium-bronze and leaded bronze. There were about 150 large and small works in the country which could be listed as follow:—

No.	Production per company per year.	Total production per year.	No. of workers.
15	>200 tons	Approx. 7,500 tons	Approx. 1,500
10	100–200 ,,	,, 1,500 ,,	,, 300
125	<100 ,,	,, 4,500 ,,	,, 1,500
150		,, 13,000 ,,	,, 3,300

An analysis of these figures showed that these 13,000 tons could be divided into 8,000 tons of copper and copper alloys, 1,250 tons of aluminium and aluminium alloys, 600 tons of zinc and zinc alloys and approximately 500 tons of various metals such as lead, magnesium, nickel, tin and alloys of these metals, in addition to 2,650 tons of divers metals and alloys.

Besides centrifugal castings made in metal moulds, ordinary metal mould castings, die castings and sand castings were being made. The raw material home basis for all this work was scrap and tin, which was smelted in the Netherlands. For ingots of standardised quality and analysis, reliance was placed largely on foreign countries.

Labour Conditions

The labour problem was of particular importance for Dutch foundries (not forgetting the non-ferrous foundries). As in other countries, they, too, were endeavouring to improve the number and the skill of workers and superintendents by improving social conditions and by training and up-grading. Shortage of

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skilled workmen was still a serious handicap for the further development of the foundry industry.

Through standardisation and specialisation, through limited mechanisation of the smaller and extensive mechanisation of the larger foundries, by research work on the whole technical and economic field of the foundries, it was imperative that the Dutch foundry industry found her rightful place at home and, he hoped, abroad as well.

On the visits, delegates would see a part of the Dutch foundry industry. Compared with the mighty industrial enterprises of other countries, these were of a modest size. Constant healthy expansion was noticeable, however. Having been a country which for her income mainly depended on trade, transport and agriculture, the Netherlands was now actively tackling the problems of increasing industrialisation, which had been made so much more difficult by the effect of the war. This development was being carried out relatively slowly after the heavy devastation which the second world war had brought about in almost every sphere. The consequences of the downfall and the difficult restoration period of Germany, formerly so important for the Netherlands, the slow building-up of the relations with Indonesia, made the concentration of all the country's forces necessary to create possibilities of subsistence for the steadily growing population.

Industrialisation meant that in the proverbial land of wooden shoes and windmills, industry had to play an increasingly important role.

Some figures might illustrate this (figures of the Netherlands Central Bureau of Statistics):—

	Population total, number of inhabitants (in millions).				Increase and decrease in population, per cent.	Density of population per sq. km.
	1829	1920	1939	1947	1939-1947	1947
Netherlands ..	2.6	6.85	8.8	9.6	+ 9.7	292
Belgium ..	—	—	8.4	8.4	+ 0.4	282
W. Germany ..	—	—	40.1	47.1	+17.2	192*
France	—	—	41.1	41.1	—	75
U.K.	—	—	47.8	49.5	+ 3.7	205
United States ..	—	—	130.9	144.0	+10.1	18

* Increase in population due to influx of displaced persons from the East.

A statistical record of occupations in 1920 showed that about one million people were employed in industry and about 640,000 people in agriculture, fishing and hunting of a total number of people employed of 2.7 million. In 1930 these figures were respectively 1.3 million and 650,000, of a total number of employed of 3.2 million.

To give an appreciation of the growth of technical training, the following figures of elementary and more advanced technical school (trade schools and colleges) and the total number of pupils are given:—

	School.	Total number of pupils.
1930	711	125,963
1940	739	155,078
1946	736	185,788

The higher technical education (Delft Technical High School), the number of students increased from 1,734 in 1930-31 to 5,424 in 1947-48.

Netherlands Technical Foundry Association

As a scientific society of the iron, steel and non-ferrous foundry industry, it was founded in 1927. In ever-increasing co-operation with the scientific departments of Delft University and the Central Institute for the Testing of Materials at Delft, supported by nearly the whole foundry industry of the country, the committee attempted by lectures, training courses, technical advice, study of literature and a library, to fulfil the vision which the founders had. If was added to this the yearly contact with the *Comité International des Associations Techniques de Fonderie*, then thoughts might usefully turn back to the same hall where the International Congress, 1949, had just been opened.

Finally, he thanked the members once more for their presence. He hoped that the country, people and industry would give the conviction that five years of war had not been able to break the stubborn will to live which was expressed in the device of the coat of arms, *Je maintiendrai*. The Netherlands wanted to get on, wanted to use all her power to prove that of the large international family of nations, it was only a modest but a still hard-working member. What was needed was peace—peace everywhere on earth. This should be the deepest meaning of the common international work.

Technical Sessions

After luncheon, offered by the Dutch Foundrymen's Association, at the Hotel Krasnapolsky, the Congress went into technical sessions. At the same time, there was held a meeting of the "International Committee." As a result of its deliberations, Prof. Pisek was elected president for 1950, and Mr. Spies for 1951. There will be no international gathering next year, but in 1951 there will be a resumption of activities in Belgium.

In the evening there was a reception by the Lord Mayor of Amsterdam at the Municipal Art Gallery. A charming and well-organised function, where the members saw a mixture of really great masterpieces and Piccasso at his best, or worst, according to taste.

Works Visits

The next day (Tuesday) the members were up early to visit either the great factory of Philips at Eindhoven, or to Utrecht, where two foundries were visited—Werkspoor and J. M. de Muinck Keizer. The former manufactures railway rolling stock, marine engine castings and ingot moulds, the last-named by the cement-sand moulding method. It has two foundries, one for the larger castings and the second, which is mechanised, for the smaller type. In this foundry, the weekly melt is

of the order of 200 tons, making about 150 tons of good castings. For this production about 150 men are employed, made up of 100 moulders, 18 apprentices, 30 core-makers, 30 fettlers, 30 ladlemen,* 30 crane men, 10 foremen, 40 maintenance men, and three scrap yard men. In the patternshop there are 87 employees, including a further 18 apprentices. The production is 30 tons per man per year, or 1.20 per square metre per year. Synthetic sand is largely used. Thirteen moulding machines and three core blowers are in service. Handling is effected by 26 cranes and two grab buckets.

The quality of casting is irreproachable; the plant has been largely modernised, and, under the enlightened management of Mr. Abconwer, progress will be continued. Before the works were visited—and this was done in every case—the visitors were given a survey of the plant and its production. From these talks it was learnt that there was no dearth of apprentices where proper graduated instruction was given. The canteens served no hot meals nowadays, but provided good conditions for eating under light, airy and essentially clean conditions.

After an excellent luncheon served in a restaurant, at which the visitors were the guests of the two managements, there was a changeover so that those who had been at Werkspoor now went along to "Dem Ka" and *vice versa*.

"Dem Ka" is a very interesting establishment, as it uses its not inconsiderable steel-melting plant for providing liquid steel for either ingots or castings. There are two oil-fired 25-ton open-hearth furnaces and two electric-arc furnaces of 25 and 7½ tons. The larger electric furnace is of British manufacture and does credit to its country of origin. Within the actual foundry there is a 10-cwt. high-frequency furnace. A battery of British moulding machines services one bay and is giving good service. There is a continuous core-drying oven, and an excellent suite of control and research laboratories. "Dem Ka" regularly turns out castings weighing up to 30 tons. The firm also possesses an extensive wire-drawing department.

Wednesday, August 31

For most delegates, some time was spent attending the technical sessions, but our representative was again in committee; however, by noon he was *en route* to board a steamer bound for Ymuiden. Each visitor was presented with a very large packet of sandwiches. On arrival, after posing for the usual photographs, the grand tour of the blast furnaces, coke ovens, steelworks and a sand-spun pipe foundry was made. The Royal Dutch Iron and Steelworks are, as this type of works goes, quite recent, as they were established in 1924. Under the management of Mr. Spies, the extensive damage done during the war has now been repaired and they, using imported raw materials, are now in full blast. After the tour the delegates were entertained to "tea," that is, a combination of a sort of mothers' meeting and a cocktail party. Here each delegate was presented with a brochure carrying on the first page the photograph taken earlier in the day.

In the evening the delegates were taken by motor-coach to Harlem, where, in the candle-lit ancient museum, Mr. Cruys Voorbergh delighted a foundry audience by showing it the costumes worn in olden days by the aristocrats and peasantry. Mastery of his subject, coupled with his great histrionic ability, were of such a character as simultaneously to teach and amuse a fairly "hard-boiled" audience.

Thursday, September 1

This day was taken up entirely with works visits at Hengelo on the German border. It was quite a long train ride, and the glorious weather was perhaps a little too glorious. However, on arrival, the delegates were received in the staff club room of Stock Brothers, a very charming building. Here they were given descriptions of the works of Stock and of Dikkers. The former works has throughout its long history given serious attention to welfare. Pension schemes, model villages, bathing facilities, and so forth. Fatigue and the weather prevented our representative from visiting this concern, which has a variety of output, including sugar machinery, textile, Diesel engines and the like. The visit would have been during the afternoon, for the morning was spent at Dikkers. This concern makes a wide range of non-ferrous, steel and iron castings. A new treatment shop has recently been equipped with electric furnaces so designed that they can undertake either light alloy or steel treatment. They are of Dutch origin. The steelfoundry operates the side-blown Bessemer system. The cupolas used in connection with this plant also are used for the provision of liquid cast iron. Our representative understood that the moulders sometimes work for the iron and sometimes for the steelfoundry.

The evening for most was free, but for members of the International Committee a private dinner party was held at the invitation of Mr. and Mrs. Spies. For the fortunate ones, this was indeed a delightful function.

Friday, September 2

The morning was taken up with technical sessions and an extraordinarily good impression was received of an audience, predominantly Dutch, following attentively the lectures delivered in English by a Netherlander. At mid-day, the delegates and their ladies embarked on three motor-boats for a tour of the very extensive canal system of Amsterdam. On returning to the Royal Institute for the Indies, where all technical sessions were held, the visitors were shown a documentary film on the Netherlands, and then an exhibition of Javanese dancing. In the evening, there was the closing banquet held at a restaurant—the Minerva—in the suburbs.

For the ladies accompanying the members there was a special programme arranged, and from all accounts the participants enjoyed themselves to the full. They, like the delegates, will have lasting memories of the kindly, courteous reception accorded to them by the Dutch foundrymen and nation.

* This figure is taken from notes but we fear it is wrong. Possibly it should read labourers.

Planning and Competition in Industry

Organised Exchange of Knowledge

Mr. Robert Shone, Director of the British Iron and Steel Federation, disagrees with the widespread view that planning and competition are like oil and water—in any one industry they do not mix well and the one weakens the effect of the other. In a Paper at the meeting of the British Association at Newcastle-upon-Tyne, recently, Mr. Shone said that planning was in fact necessary in many industries to get the best out of competitive activity. The basis of co-operative or planning action in industry was the collection and exchange of information, he said. This was illustrated in the formulation of the steel industry's development plan, which was based on the organised exchange of knowledge; the provision of expert technical advice and services; and, finally, the working out, broadly, of a competitive solution in advance of action, by firms subject to the responsibilities of the balance-sheet and the profits test.

Industrial planning also involved the organisation of "external economies" which could not be secured by individual firms in isolation. This was further instanced in the steel industry in connection with co-operative research, recruitment and training plans, the national scrap campaign, and market development studies.

Mr. Shone said that Marshall and other economists had generally regarded external economies as emerging in a haphazard way as an industry grew in size. But, in fact, common action could be taken to organise such economies, with highly beneficial effects on industrial efficiency. The advantage of such a course was that the economies were secured without the excessive growth in the size of the operating unit which would be needed before these benefits could be organised internally.

Government's Planning Functions

The speaker said that the organisation of external economies need not in any way weaken competition between firms. What did weaken competition was excessive inflationary or deflationary pressure in the economy as a whole. In an inflation, Governments necessarily set up restrictive allocation and control schemes, preventing the proper pressure of competition; equally, in a depression, the managements and the unions tended to operate similar defensive measures in the opposite direction. The planning functions of the Government which could assist competition thus consisted in aiming at a reasonable balance between overall demand and supply; and in retaining, as far as possible, an impartial position in relation to industry—influencing policy in regard to imports and exports, location and the many questions arising as between particular industries, or between labour and management.

Competitive industry was driven by the varied incentives which provided the natural head of energy in the economic system; Government planning could help in defining the channels through which enterprise flowed, while industrial organisations could contribute to efficiency by dredging and clearing those channels.

A combination of planning and competition was needed if the maximum efficiency and effectiveness of industrial effort were to be secured. Mr. Shone said it was vitally important that the results of various experiments in securing this balance—for example in the steel industry—should be carefully weighed before they were replaced by some different arrangement.

Increases of Capital

Details of increased capital have been announced by the following companies:—

GLOW-WORM BOILERS, LIMITED, Milford, near Derby, increased by £50,000, in 200,000 shares of 5s., beyond the registered capital of £14,000.

A. J. SOARES & COMPANY, LIMITED, metal merchants, etc., of Dunstable, increased by £4,900, in £1 ordinary shares, beyond the registered capital of £100.

RICHARD CORT & SON, LIMITED, engineers, founders, etc., of Reading, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £100,000.

JET-LITE COMPANY, LIMITED, ironmasters, founders, etc., of Cleveleys, Lancs, increased by £2,900, in £1 ordinary shares, beyond the registered capital of £100

JOHN ELWELL, LIMITED, iron, steel, tinplate, and metal merchants, etc., of Oldbury, increased by £25,000, in £1 second preference shares, beyond the registered capital of £25,000.

SOMERVILLE-BARNARD CONSTRUCTION COMPANY, LIMITED, ironfounders, engineers, etc., of New Cross, London, S.E.14, increased by £25,000, in £1 shares, beyond the registered capital of £50,000.

J. STONE & COMPANY, LIMITED, engineers, non-ferrous founders, etc., of Deptford, London, S.E.4, increased by £600,400, in £1 "A" ordinary shares, beyond the registered capital of £1,200,400. On July 5, 1949, the 600,400 "A" ordinary shares were converted into "A" ordinary stock.

New Trade Marks

The following applications to register trade marks appear in the "Trade Marks Journal":—

"WARCO"—Unwrought and partly-wrought common metals and alloys. WARCO PRODUCTS, LIMITED, Saltisford, Warwick.

"ALPOL"—Unwrought and partly-wrought aluminium and aluminium alloys. UNITED ANODISING, LIMITED, 50, Gresham Street, London, E.C.2.

"BIRLON"—Partly-wrought common metals having a protective coating. BIRMETALS, LIMITED, Woodgate Works, Quinton, Birmingham, 32.

"BIRLOY"—Unwrought and partly-wrought nickel alloys, and rods, etc. BIRLEC, LIMITED, Birlec Works, Tyburn Road, Erdington, Birmingham, 24.

"CONVERTAKREET"—Refractory material for lining furnaces. KINGSCLIFFE SUPER-REFRACTORIES, LIMITED, Sandiron House, Beauchief, Sheffield, 8.

"ROCKSTAND" (SEASCAPE DEVICE)—Unwrought and partly-wrought non-ferrous metals. ROKKER & STANTON, LIMITED, Drayton House, Gordon Street, London, W.C.1.

"SIMGAL"—Unwrought or partly-wrought common metals and alloys. JAMES BOOTH & COMPANY, LIMITED, Argyle Street, Works, Argyle Street, Nechells, Birmingham, 7.

"ARBAL"—Metal rods for welding and soldering aluminium and aluminium alloys. ARBAL S.A., c/o Marks & Clerk, 57-8, Lincoln's Inn Fields, London, W.C.2.

"ESH DOLPHIN" (FISH DEVICE)—Electric scaling machines. ELECTRIC SCALING HAMMERS, LIMITED, Grosvenor Gardens House, Grosvenor Gardens, London, S.W.1.

Company News

The paragraphs below have been extracted from statements circulated to shareholders, speeches made at annual meetings, and other announcements.

Tata Iron & Steel Company, Limited (MR. J. R. D. TATA:—While the second year of India's independence has brought calmer political conditions, the economic sphere is still gloomy. There has been complete stagnation of the investment market. It is practically impossible for any industrial concern to raise money for any purpose. The company's production of saleable steel has increased from 664,000 tons in the previous year to 671,000 tons—a negligible increase. The labour situation, while slightly better, still causes anxiety. The average labour cost per ton of finished steel has gone up from Rs. 31.54 in 1939-40 to Rs. 92.80 in 1948-49, and the average output per employee has declined from 24.36 tons in 1939-40 to 16.30 tons in 1948-49. The number of men employed—several times the number required in America and Europe—far exceeds those required even under Indian conditions. The output per man in the company's structural shops is ½ ton per month, whereas the average in similar shops in the United States is 5 tons per month. One of the principal recommendations of the tariff board accepted by the Government is that the company should convert the deferred shares into ordinary shares. A minority of deferred shareholders has blocked this scheme. The directors are willing to take steps to put through a conversion scheme if there is enough evidence that the scheme would go through. If not, they will have to inform the Government that they are unable to carry out its directive, leaving further action to the Government. At the Government's request, a programme for expanding the output by about 200.000 tons at an estimated cost of Rs. 15 crores has been submitted. It has been made clear to the Government that such a project could only be implemented if it advanced a substantial part of the cost. Even assuming that the expansion scheme were dropped, a little over half the cost mentioned represented necessary replacements and, in addition, a little over Rs. 1 crore would be required each year for routine and renewals. It appears that the company would need to raise additional capital of the order of Rs. 3 to Rs. 5 crores. Whether such amount should be raised as share capital, debentures, or borrowings, is a matter still to be decided by the directors.

George Cohen, Sons & Company, Limited, iron, metal and machinery merchants and engineers, of Hammersmith, London, W.6 (MR. C. M. COHEN):—The fall in combined profits for the year ended March 31 is not attributable to any serious decline in the volume of business transacted. This proved to be substantially the same as last year, the total aggregate turnover of the group being under 2 per cent. lower than that of the previous year. We have encountered a combination of the various factors which have adversely affected so many undertakings of late. Markets, both at home and abroad, have progressively become more competitive, necessitating smaller profit margins as well as increased selling effort and expense to maintain turnover—while certain other major costs have, at the same time, steadily risen from causes quite outside our control. We regard the volume of business which the group is handling as satisfactory. In particular, production at our major plants has expanded and they have well-filled order-books, at remunerative prices, which should keep them fully occupied for some time ahead.

Charles Carr, Limited, non-ferrous founders, of Smethwick, Staffs (MR. DUNCAN CAMPBELL):—The trading profit for the year has amounted to £27,974, which compares with £40,628 for 1948. The reduction is explained by the fact that we have now entered a buyer's market, and are having to quote much keener prices. Another reason is that one of the company's main activities is the manufacture of axle-box bearings for rolling stock, and while we know there will be for a considerable time an acute shortage of rolling stock, the steel position is preventing manufacturers from increasing their production, and this naturally affects the number of bearings they require from us.

John Harper & Company, Limited, ironfounders, of Willenhall:—Permission has been received from the Capital Issues Committee for the bonus issue of 150,000 4½ per cent. cumulative redeemable preference shares of £1 each, fully paid, which represents 62½ per cent. on the present paid-up capital. It was hoped that it would be possible to hold the necessary class meetings and extraordinary general meeting on the same day as the annual general meeting, but unavoidable delays have rendered this impossible. It is the intention of the board that the new shares shall bear interest from October 1, 1949.

William Blythe & Company, Limited, manufacturers of industrial chemicals, of Accrington:—Meetings will be held on September 30 to sanction the scrip bonus proposals. The distribution is of one new ordinary share for each share held and one new 5 per cent. 5s. non-cumulative second preference share for every two ordinary shares held. The new ordinary shares will not participate in the interim dividend now announced nor in the proposed special capital dividend of 1s. 5d. cash in respect of each existing ordinary share, payable September 30 (without deduction of tax).

Northampton Polytechnic

This go-ahead technical institute is following up the excellent system carried out during the last few years of providing a well-graduated course of lectures on specialised subjects. This session there are to be two courses. The first is to cover "Recent Trends in Fuel Technology," and the second, "Ceramics—Their Production. Testing and Utilisation." The former, a series of 20 lectures, costs 30s., and the latter, 12 lectures for 21s.

A letter addressed to Dr. J. E. Garside, the head of the Department of Applied Chemistry at the Northampton Polytechnic, St. John Street, London, E.C.1, will ensure interested parties receiving full details of these excellent courses of studies.

Training of Apprentices in the French Foundry Industry

The official exchange Paper from the Association Technique de Fonderie *to the Institute of British Foundrymen for presentation at the Institute's Annual Meeting, "The Organisation for the Training of Apprentices in the French Foundry Industry," by Mr. D. Wæles, was published in the* JOURNAL *for July 7.*

The CHAIRMAN, when introducing MR. V. DELPORT to present the Paper on behalf of the Author, said he was sure that he would be able to give a good idea of plans and experiences which were contained in the Paper.

DISCUSSION

MR. V. C. FAULKNER, Past-President, said he probably knew more about the Paper than any of them, because he had spent a pleasant week-end translating it. It would be realised that the efforts made in this country and in France for the training of apprentices for their industry ran on parallel lines. The greatest difference between the two, however, was in the training of foremen, which in France was distinctly superior.

With regard to the training of apprentice moulders, he would not advocate that a young prize-winner should be placed on a pedestal as was done in France, because in this country there was the danger that he might suffer from swollen head. He believed that in France they would welcome a similar Paper from us and, as he had himself made a fairly extensive study of the technical facilities available to young workers, he would be willing to prepare a similar Paper on the subject next year for presentation in France.

DR. J. G. PEARCE said he wished to congratulate the Author on the comprehensive account he had given of French foundry training, and hoped in the not distant future to have another opportunity of examining the work of the French *Ecole Superieure de Fonderie*, the aim and purpose of which closely followed those of the National Foundry College.

It appeared that in relation to the size of the respective countries and the size and output of the respective founding industries, the French were training for their industry about four times the number of technicians that were being trained in this country. There was only one way in which the industry could proceed in future, and that was on technical lines, irrespective of whether it was worked on a craft or continuous-production basis, if it was to be organised to take its proper place in the economy of a country increasingly based on export markets and if it was to satisfy the natural ambitions of those who had entrusted their careers to it. One of the peculiar advantages of the National Foundry College was that employers could nominate suitable students to take the course, and it was imperative that they should do so, because they would have had an opportunity to satisfy themselves that their nominees had the necessary qualities for leadership in the foundry and the question of absorption by the industry did not arise. Of course, the College was not confined to nominations by employers, and independent students could also obtain admission. So far from ensuring that in reasonable time every significant foundry would have at least one properly trained man, the number of students at present entering the College would not supply the annual wastage.

The College was supported by the Institute, and he knew no one who had been more active in promoting its welfare, or more sympathetic to its aims. than their representative on the Board of Governors, Mr. C. C. Booth. If any man in the industry had the necessary brains, preliminary education and practical training, here was the machinery by which he could be trained in less than a year, or about 16 months if he was not up to standard for the diploma course on entry. In the more competitive conditions which lay ahead, the trained man would provide the best insurance premium a firm could have, and the French had shown the way.

MR. BOOTH asked that all delegates should plead for this question of support for the Foundry College to be a subject for discussion at council meetings on their return home. He had, himself, written to every council secretary making a similar plea. He believed it to be the fact that there were many Institute members who did not know what the College was doing. It was considered by the Minister of Education to be one of the best trade colleges in the country.

MR. J. H. OSBORN, a pupil at the College, said he would like to congratulate Mr. Pearce on what he had said on behalf of the College.

DR. PEARCE, thanking the last speaker for his remarks, said that recently there had been started a hostel at the College where men could live for a year under public school conditions.

New Patents

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed, and all subsequent proceedings will be taken.

618,436 OSTERMANN, O., and BLENDIN, E. Apparatus for blowing sand into foundry core boxes.
618,467 UDY, M. J. Metallurgy.
618,501 MOORE, W. E. Furnace electrode regulators.
618,563 STONE-FRY MAGNESIUM, LIMITED, PECHAL, F., and PAYNE, R. J. M. Production of pressure die castings from magnesium base alloys.
618,700 BRADBURY, T. F. Aluminium base alloy.
618,866 AKT.-GES. OEDERLIN & CIE. Apparatus for making annular castings.
619,292 BIRLEC, LIMITED, and HARRIS, J. Furnaces for the heat-treatment of materials.
619,341 AKT.-GES. BROWN, BOVERI & CIE. Method of fusing iron and iron alloys with carbon, and bodies produced according to this method.
619,379 FORD MOTOR COMPANY, LIMITED. Production of foundry cores.
619,543 RENUT, P. C. M. Casting steel in ingot moulds.
619,676 BROADBENT, D. S. Machines for the continuous cooling and casting of liquid materials into solid slab form.
619,834 FEDERATED FOUNDRIES, LIMITED, CHAMBERLAIN, E. A. C., and MACMILLAN, H. Domestic fregrates.

STANTON-DALE

REFINED PIG IRON

Designed to meet the demands of high quality castings, which are, strength, machineability, and resistance to wear.

All these can be secured by using Stanton-Dale Refined Pig Iron in your cupolas.

The above illustration shows a group of castings made by Messrs. Goodbrand & Co. Ltd., Stalybridge, Cheshire.

PROMPT DELIVERY

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Personal

MR. FITZHERBERT WRIGHT has joined the board of Sigmund Pumps, Limited.

MR. J. BLAKISTON, consulting engineer, is now in India on a routine visit to his clients.

MR. D. FARNWORTH has been appointed to the board of Blaw-Knox, Limited, manufacturers of steelworks and furnace equipment, of London, N.1.

DR. R. GENDERS, consulting engineer and metallurgist, has opened an office at 20, Buckingham Gate, London, S.W.1. The telephone number is Victoria 0282.

MR. M. W. THRING, physicist on the staff of the British Iron and Steel Research Association, is at present in the United States surveying American steelmaking technique.

MR. NORMAN TAYLOR, personnel manager of Marshall, Sons & Company, Limited, engineers, boilermakers, etc., of Gainsborough, Lincs, has been appointed personnel and establishment officer to the West Midlands Gas Board.

MR. V. R. PREHN, who joined the overseas department of Ruston & Hornsby, Limited, engineers, boilermakers, etc., of Lincoln, in 1937, becoming a director in 1947, has been appointed a director of Ruston-Bucyrus, Limited.

MR. HENRY F. SPENCER has been appointed a director and he and MR. LESLIE J. DAVIES, also a director, have been appointed assistant managing directors of Richard Thomas & Baldwins, Limited. Mr. Davies will continue as general manager of the Ebbw Vale works and Mr. Spencer will continue as commercial general manager of the company.

MR. S. W. RAWSON has been appointed to be a managing director of John Brown & Company, Limited, Clydebank, with headquarters in London. He will retain his interest in the business of Thos. Firth & John Brown, Limited, Sheffield, and will be in general charge of the company's investments. Mr. Rawson will take up his duties as from November 1.

MR. J. S. MCCALL, a director of Baker Perkins, Limited, manufacturing engineers and founders, of Peterborough, for the past five years, is resigning in order to take up an appointment with Canadian Baker Perkins, Limited, Toronto. Mr. McCall joined the original firm, Werner Pfleiderer & Perkins, in 1912, and he was with the Canadian company from 1919 to 1933.

MR. W. R. S. STEPHENSON was last week nominated to succeed Lt.-Col. J. P. Hunt as Master Cutler. His father, the late Sir Henry Stephenson, was Master Cutler 30 years ago. Mr. W. R. S. Stephenson is joint managing director of Thomas Turton & Sons, Limited, and a director of George Butler & Company, Limited. He will be installed as Master Cutler on October 4.

MR. E. T. GILL is joining the Climax Molybdenum Company of Europe, Limited, on October 1 as metallurgical engineer. After obtaining initial industrial experience in ferrous metallurgy with Hadfields, Limited, Sheffield, and Samuel Fox & Company, Limited, Stocksbridge, near Sheffield, he joined Bruntons (Musselburgh), Limited, as chief metallurgist. After two years with the Aeronautical Inspection Directorate, he was appointed to the metallurgical staff of Imperial Chemical Industries, Limited, Billingham. Early in 1943, Mr. Gill was seconded to Firth-Vickers Stainless Steels, Limited, Sheffield, to be works manager of the M.A.P. Factory at Pindar Oaks, Barnsley. In 1945 he joined Edgar Allen & Company, Limited, Sheffield, as deputy to the chief metallurgist, Dr. Edwin Gregory.

Wills

GRAHAM, C. S., of Scunthorpe, Lincs, chief chemist and metallurgist at the Normanby Park Works of John Lysaght, Limited	£5,900
CLAY, S. R., of High Wycombe, a director of Broom & Wade, Limited, manufacturers of air compressors, pneumatic tools, etc., and of B.E.N. Patents, Limited	£41,267
PAXMAN, E. P., of Colchester, Master of the Worshipful Company of Farriers, managing director of Davey, Paxman & Company, Limited, Colchester, and a director of Ruston & Hornsby, Limited, Lincoln	£40,348

Hill Top Bonus Scheme

For the second year in succession, the Hill Top Foundry Company, Limited, announces that there is to be a bonus distribution to employees of one-tenth of the year's profits—amounting to £3,975.

The discovery, recently, of a 1799 invoice proved the firm to be at least 150 years old. To-day it employs about 300 people. Among the directors is Mr. T. Bunn, whose great grandfather was a moulder in the original Hill Top business. Three descendants of the founder of John Cartwright & Son, with which the Hill Top Company merged, are on the board. One of them, Mr. Richard Bettinson, is chairman, and his brother, Mr. Charles Bettinson, is managing director. Workpeople have equally long family associations. The bonus scheme, which is on a points basis, was introduced to cement still further the happy relationship between the firm and its employees.

Wages Award for Metal Finishers

Increases in hourly pay rates for the lower paid grades of workers in the metal-finishing industry have been awarded by the National Arbitration Tribunal, sitting under the chairmanship of Sir W. David Ross. Grade 2 men will receive ½d., women a ½d., more than the present rates. Increases in grade 3 will be 1½d. (men) and 1½d. (women).

The workers had claimed 3d. per hr. increase for all adults, with proportionate increases for juveniles. The tribunal has referred back for negotiation the question of juvenile rates. Adults will receive the new rates from the first pay period after August 23, 1949. Workers already receiving higher wages than those set out may continue to receive them. There is no change in the rates for grade 1 workers.

NEW

CHELFORD
Processed Washed Sand

A modern plant has been installed for the washing and grading of Chelford Sand. This plant is of the latest and most efficient type and Chelford Processed Sand can now be supplied thoroughly washed and in two grades, coarse and fine. The chief features are as follows :—

COARSE GRADE

Grading mainly between 30 and 85 mesh B.S.S. and practically free from fines below 85.

Uniform grading gives closer control of mixtures.

Increased permeability.

Negligible clay content.

Superior to natural sand for special purposes e.g. synthetic moulding mixtures, cement moulding process, etc.

FINE GRADE

Practically all passing 60 mesh B.S.S. with main grain size between 72 and 150.

Uniform grading.

Low clay content with increased refractoriness.

Excellent for fine cores and for addition to facing sand mixtures where smooth finish is desired.

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Raw Material Markets

Iron and Steel

The volume of orders being placed with the foundries generally remains steady. Most foundries are fairly well employed, and in some instances reports indicate increased activity, which may be due to replenishment of consumers' stocks. It is expected that increased demands for castings will be forthcoming now that the holiday season is over.

The demand for all foundry grades of pig-iron and hematite is upheld, the recession in trade having had little effect on the distribution of pig-iron supplies. Previously, outputs of pig-iron were totally inadequate for foundry requirements, and present supplies are not in excess of demand. After meeting current needs there is still little, if any, left for stock at most foundries. Permission has now been given by the Ministry for a stock equivalent to six weeks' consumption instead of three weeks. This is desirable to allow for any delay which may arise due to bad weather or other causes.

High-phosphorus pig-iron for the light foundries is readily taken up, and while the supply position will be improved by another furnace coming into production shortly in the Derbyshire area, the overall output of this grade will not show any appreciable increase over consumers' current needs.

Present and potential requirements of low- and medium-phosphorus pig-iron and hematite for the general engineering, jobbing, and speciality foundries indicate that a much larger tonnage could be utilised for current outputs of castings if it were available. As it is, many of these foundries find it necessary to augment supplies by acquiring other grades at increased prices, including the refined irons, which are at present in fairly easy supply. The scrap position is easier, but demand for cast-iron and steel cupola scrap remains strong.

Foundry coke is coming forward satisfactorily and foundries have been able to accumulate some stock, which should be of advantage during the winter period. Limestone and ganister are easily obtainable.

A high rate of activity in the re-rolling industry ensures the ready absorption of all the steel semis which the British mills are capable of delivering, and most of the defective material which the makers have to offer is also disposed of quickly. Pressure for imported material is, however, considerably reduced. This, of course, is not surprising, as imports in the last few months have been exceptionally heavy. In view of the financial stringency, a reduction in the shipments of Continental semis to British ports would only be in accordance with expectations and, indeed, might be justified by existing circumstances. Re-rollers appear to be more eager for export allocations, which suggests that the home market is less keen than it was in the first half of the year.

Of late there has been some abbreviation of indicated delivery dates for sections, channels and joists, which suggests that the mills are gradually overtaking their commitments, but the plate mills are still working to the limit of their capacity and the weekly flow of specifications, particularly for the lighter gauges, is overwhelming. Rail mills are still turning out very large tonnages and have contracts running into 1950, while sheet mills have still more impressive commitments.

Non-ferrous Metals

When on Monday of last week the Ministry of Supply announced an increase of £2 15s. in the price of zinc, from £63 10s. to £66 5s., adverse criticism of its action was evoked on the grounds that only two of the American smelters had advanced their quotations to 10¼ cents, while the export price was certainly unchanged. However, the authorities appeared to be nervous and the rise took place. But it was short-lived, for a week ago news was received that the U.S. quotation had levelled out again at 10 cents, and on Saturday the Ministry of Supply returned to £63 10s. once more. It would certainly have been better had the Ministry held its hand and kept the price at £63 10s. pending clarification of the American situation. There really does not seem to be any reason why the zinc quotation should advance just now, for supplies appear to be ample.

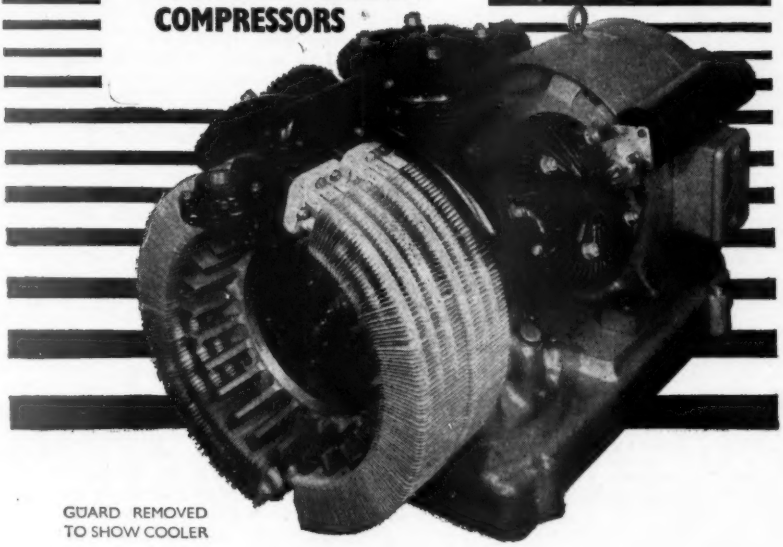
The British Bureau of Non-ferrous Metal Statistics announces that stocks of zinc in the United Kingdom at July 31 stood at 81,718 tons, an advance of fully 6,000 tons on the June figure, and nearly twice as much as March. Consumption in July at 19,151 tons compared with 21,509 tons in June. In lead, consumption was 23,870 tons, against 27,296 tons in June, while stocks at 54,679 tons, although 5,000 tons lower than in June, were more than twice as much as in January last.

Arrangements have now been concluded by the Ministry of Supply to cover the sale of Straits tin to the United States consumers, and, as was rather to be expected, the trade experts have been called in and will act as agents for the British authorities. This is a step, but only the first step, towards freedom of trading, but at least the firms handling the tin will be able to contact their previous customers. Initially, there was something of a hitch owing to a difficulty over forward tin, but this has now been resolved by arranging that American dealers wishing to purchase ahead are allowed to delay fixing the price of the metal until up to 10 days after arrival of the vessel at New York. Apparently the price will remain at $1.03 per lb. It is understood, however, that under this new arrangement the buyer will be protected against any fall in price between the date of ordering and date of delivery. Since a fixed price is to persist, it would not seem that there is any opportunity yet for a resumption of futures trading in New York. Indeed, it is understood that this conclusion has been reached by the Committee of the Commodity Exchange.

THERE ARE 490 additional names of foundries to be added to the next edition of *Ryland's Directory*. These have all come into existence since the war ended.

BULLOWS

MULTI-CYLINDER COMPRESSORS



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IMPERVIOUS TO DUST.—Sealed crankcase and efficient air filters.

DELIVER COOL DRY AIR.—Efficient inter- and after-coolers cool air BEFORE entering air receiver.

PROVED RELIABILITY.—Simple construction, generous working parts. Bullows Patent Valve Gear.

★ *LIGHT · COMPACT · SILENT · FREE FROM VIBRATION*

Available in sizes up to 108 C.F.M. displacement—one, two or three stages.

Working pressures from 25—350 lb./sq. in.

We shall be pleased to send full particulars or arrange for a representative to call.

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105, WHITEFIELD ROAD GLASGOW, S. W.1.

Company Results

(Figures for previous year in brackets.)

WILLIAM BLYTHE & COMPANY—Interim dividend of 10% (same) and special dividend of 1s. 5d. cash (without deduction of tax) on the existing ordinary shares.

ALUMINIUM CASTINGS COMPANY—No dividends are to be paid for the year ended March 31 last on the ordinary shares and on the preferred ordinary shares. The respective dividends last year were 20% and 11⅞%.

SMITH & WELLSTOOD—Net profit for the year ended June 30, after providing £22,000 (£14,496) for depreciation, £55,196 (£56,059), for income tax and £20,000 (same) for profits tax, £63,167 (£65,094); to general reserve, £45,000 (£50,000); ordinary dividend of 17½% (same); forward, £52,566 (£52,374).

A. & J. MAIN & COMPANY—Trading profit for 1948, including £8,462 balances of wartime contracts finally settled in 1948, £128,948; to depreciation, £9,286; directors' emoluments, £21,018; audit fees, £381; pensions, £5,692; taxation, £57,100; net profit, £35,471; dividend of 12½% (same); general reserve, £25,000 (nil); pensions, nil (£15,500); forward, £16,945 (£13,386).

INTERNATIONAL DIATOMITE COMPANY—Consolidated accounts for the 15 months to June 30 show group profits of £68,813, after including £4,651 profit on exchange arising in foreign subsidiary; to tax, £37,429; group profits, £31,384; tax provision no longer required, £1,494; retained in accounts of subsidiaries, £8,128; profit of parent company, £24,750; dividend of 30% for 15 months (20% for the previous year).

BRAITHWAITE & COMPANY ENGINEERS—Consolidated trading balance to March 31, £232,040 (£244,946); dividend, £9,135 (£11.739); interest, £804 (£726); profit on sale fixed assets, £1,972 (nil); to interest, £6,489 (£4.047); employees' pensions, £2,283 (£3,082); auditors' remuneration, £1,336 (£1,500); depreciation, £22,036 (£26,781); capital increase expenses Braithwaite & Company Structural, £1.567 (nil); taxation, £193,000 (£208,000); retained by subsidiaries, £9,461 (£9,985); net profit of parent company, £7,779 (£23,986); final dividend of 3½%, making 7½% (same); forward, £60,023 (£67.417 brought in, after £1.700 directors' fees).

JOHN HARPER & COMPANY—Group accounts for the year to March 27 show surplus for the year including transfer fees, £237,378 (£302.333 previously, full year for parent, and period from December 30 to March 28 in respect of subsidiary); investment income, £2,044 (£2,177); to directors' remuneration, £19,169 (£20,038); renewals of fixed assets provision, £25,000 (£26,290); audit, £355; written off assets, nil (£6,908); taxation, £103.865 (£150.163); net balance, £91,032 (£101.211); to dividend equalisation reserve, £50,000 (nil); dividend on employees' preference shares, £2,534 (same); further dividend, making 30%, £8,327 (same); second interim on the ordinary shares, making 30% (same); forward, £100.511 (£103.340).

TUNGSTEN MANUFACTURING COMPANY—Consolidated trading profit for the year to September 30, 1948, £28.178 (£13,264); other income, £1,017 (£167); to directors' remuneration, £3.780 (£3,780); depreciation, £5,110 (£1,467); written off works development, nil (£196); debenture interest, £1,014 (£454); discount on debentures, written off, nil (£600); intercompany interest, nil (£329); net profit, £19.291 (£6,605); debts recovered from occupied countries, nil (£1.222); tax not required, nil (£685); to taxation, £11,081 (£3,806); general reserve, £5.000 (£3.500); special contingency reserves, £5.000 (nil); preference dividend, nil (£626); forward, £7.651 (£7,541, plus £1.900 subsidiaries' net profits prior to September 30, 1947, not previously consolidated).

GEORGE COHEN, SONS & COMPANY—Consolidated trading profits, less losses, to March 31, £697.614 (£1.019,445); income from trade investments, £18.653 (same); other investment income, £854 (£797); to interest on overdraft, £9,657 (£5.121); emoluments of directors, George Cohen, Sons & Company £35.000 (same); audit fees and expenses, £4.217 (£3.573); depreciation, £116.850 (£89.859); profits tax, £87.713 (£127,911); income tax, £247,526 (£375,526); minority shareholders, £2.766 (£6.203); undistributed profits of subsidiaries applicable to George Cohen, Sons & Company, £3.621 (£61,985); net profit of parent company, including results of subsidiaries only to extent of dividends since declared thereby, £209,771 (£333.917); expenses of new issue written off, £13,730 (nil); to general reserve, £100,000 (£210.000); preference dividend, £29.906 (£24,904); final ordinary dividend of 12%, making 20% (same); forward, £73,558 (£73,423).

News in Brief

CROYDON FOUNDRY, LIMITED, is extending its foundry premises at Purley Way, Croydon, Surrey.

THE THIRD Yugoslavian International Fair is to be held at Zagreb from September 17 to October 2.

THERE ARE A FEW VACANCIES at the National Foundry Craft Training Centre for the third-year course, commencing October 24 and finishing November 18, and also for the fourth-year course starting November 28 and ending December 23.

THE RESULTS of the Scottish Industries Exhibition so far are stated to have "surpassed the most optimistic expectations of the promoters." The Exhibition is being held at the Kelvin Hall, Glasgow, and is due to close on September 17.

THE INAUGURATION of a new sports ground at Mortomley, near Sheffield, last Saturday now completes the first stage in a scheme to provide Newton Chambers & Company, Limited, with one of the largest works sports grounds in the country.

PLANS FOR the further development of the Grangemouth chemical factory of Imperial Chemical Industries, Limited, have been approved by a Dean of Guild Court. The latest extensions, estimated to cost £370,000, are the third stage of a £1,000,000 development plan for the factory, and will occupy a large area opposite the present works.

THE CHIEF INSPECTOR OF FACTORIES has given notice that the former Wolverhampton district is now divided into two parts, Wolverhampton South and Wolverhampton North (in which the Borough of Tipton is included). Mr. R. M. Wickenden will be the district inspector of Wolverhampton South and Miss E. M. Parker of Wolverhampton North.

THE VITAL IMPORTANCE of first-rate industrial finishing if Britain is to maintain and increase her overseas markets was stressed at a meeting of Birmingham industrialists last week. It was explained that, while the idea of an industrial finishes exhibition was new to Britain, the United States was this year holding its 36th annual industrial finishes exhibition. The first British exhibition will be held at Earls Court, London, from August 23 to September 5, 1950. It will cover a very wide range of finishes and finished products.

A CLAIM TO ALTER the existing holidays-with-pay agreement affecting labourers in the iron and steel trade has been rejected by the National Arbitration Tribunal, under the chairmanship of Lord Terrington. The employees, members of the National Union of General and Municipal Workers, claimed 12 days' annual holidays with pay and six other days annually to be regarded as holidays with pay, and double pay for anyone required to work on any of the six days.

METROPOLITAN-VICKERS FOUNDRY

In connection with the illustrated description we gave of this plant, in our issue of September 1, it is interesting to note that no fewer than 50 Stone-Wallwork moulding machines are in operation.

SEMI-SOLID "H" FOR EXCELLENT GREEN BOND AND HIGH BAKED STRENGTH

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You may or may not know that every contract carried out by a member of the Electrical Contractors Association is covered directly by a comprehensive guarantee for £500 against faulty workmanship and materials. This guarantee has rarely to be implemented. But it serves to demonstrate the confidence the Association has in the integrity and ability of its members and they in turn in the skill and practical experience of the men on the job. It puts the technician on his mettle, it imbues the Contractor with a proper sense of responsibility to his customer. The result is a higher standard all round and you—the user—reap the benefit. To avoid trouble and possible danger which faulty workmanship can bring—leave your electrical problems in the competent hands of an E.C.A. member.

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N.6

Current Prices of Iron, Steel and Non-ferrous Metals

(Delivered, unless otherwise stated)

September 14, 1949

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £10 4s.; Birmingham, £10 0s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £11 15s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 2s. 6d.; South Zone, £12 5s.

Scotch Iron.—No. 3 foundry, £11 18s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £12 14s. 6d.; South Zone, £12 17s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 4s. 6d.; South Zone, £13 7s.

Cold Blast.—South Staffs, £15 16s. 6d.

Hematite.—Si up to 2½ per cent., S & P over 0.03 to 0.05 per cent.; N.-E. Coast and N.-W. Coast of England, £11 16s. 6d.; Scotland, £12 3s.; Sheffield, £12 9s.; Birmingham, £12 15s.; Wales (Welsh iron), £11 16s. 6d.

Spiegeleisen.—20 per cent. Mn, £17 8s.

Basic Pig-iron.—£9 17s. 6d., all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.)

Ferro-silicon (6-ton lots).—20/30 per cent., £25 15s.; 40/55 per cent., £32 10s.; 70/85 per cent., £49.

Ferro-vanadium.—35/50 per cent., 15s. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 6s. 5d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, 1s. 3¼d. lb.

Ferro-tungsten.—80/85 per cent., 7s. lb.

Tungsten Metal Powder.—98/99 per cent., 8s. lb.

Ferro-chrome.—4/8 per cent. C, £60; max. 2 per cent. C, 1s. 5d. lb.; max. 1 per cent. C, 1s. 5¼d. lb.; max. 0.15 per cent. C, 1s. 6½d. lb.

Cobalt.—98/99 per cent., 12s. lb.

Metallic Chromium.—96/98 per cent., 5s. 1d. lb.

Ferro-manganese (blast-furnace).—78 per cent., £25 3s.

Metallic Manganese.—94/96 per cent., carbon-free, 1s. 9d. lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms and Slabs.—BASIC: Soft, u.t., £16 16s. 6d.; tested, up to 0.25 per cent. C (100-ton lots), £17 1s. 6d.; hard (0.42 to 0.60 per cent. C), £18 16s. 6d.; silico-manganese, £23 19s.; free-cutting, £20 1s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £22 4s.; case-hardening, £23 1s. 6d.; silico-manganese, £26 6s. 6d.

Billets, Blooms and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £19 16s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 1s. 6d.; acid, up to 0.25 per cent. C, £23 1s. 6d.

Sheet and Tinplate Bars.—£16 16s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Plates, ship (N.-E. Coast), £20 14s. 6d.; boiler plates (N.-E. Coast), £22 2s.; chequer plates (N.-E. Coast), £22 19s. 6d.; heavy joists, sections and bars (angle basis), N.-E. Coast, £19 13s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 6s.; flats, 5 in. wide and under, £22 6s.; rails, heavy, f.o.t., £19 2s. 6d.; hoop and strip, £23 1s.; black sheets, 17/20 g., £28 16s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £35 6s. 6d.; nickel-chrome, £49 18s. 6d.: nickel-chrome-molybdenum, £55 0s. 9d.

Tinplates.—I.C. cokes, 20 × 14, per box, 41s. 6d., f.o.t. makers' works.

NON-FERROUS METALS

Copper.—Electrolytic, £107 10s.; high-grade fire-refined, £107; fire-refined of not less than 99.7 per cent., £106 10d.; ditto, 99.2 per cent., £106; black hot-rolled wire rods, £116.

Tin.—99 to under 99.75 per cent., £569; 99.75 to under 99.9 per cent., £572 10s.; min. 99.9 per cent., £577.

Zinc.—G.O.B. (foreign) (duty paid), £63 10s.; ditto (domestic), £63 10s.; "Prime Western," £63 10s.; electrolytic, £64 5s.; not less than 99.99 per cent., £65 5s.

Lead.—Good soft pig-lead (foreign) (duty paid), £87 5s.; ditto (Empire and domestic), £87 5s.; "English," £88 15s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, all English destinations £79 10s. (Scotland and N. Ireland, £82); rolled zinc (boiler plates), £77 10s. (£80); zinc oxide (Red Seal), d/d buyers' premises, £63 10s.

Other Metals.—Aluminium, ingots, £93; antimony, English, 99 per cent., £160; quicksilver, ex warehouse, £18 10s.; nickel, £224.

Brass.—Solid-drawn tubes, 20d. per lb.; rods, drawn, 10¾d.; sheets to 10 w.g., 16¼d.; wire, 16¾d.; rolled metal, 14¾d.

Copper Tubes, etc.—Solid-drawn tubes, 19¾d. per lb.; wire, 144s. 9d. per cwt. basis; 20 s.w.g., — per cwt.

Gunmetal.—Ingots to L.G.2 (85/5/5/5), £77 to £90; L.G.3 (86/7/5/2), £80 to £118; GI (88/10/2), £126 to £156 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £126 to £170; L.P.Bl, £88 to £118 per ton.

Phosphor Bronze.—Strip, 22¾d. per lb.; sheets to 10 w.g., 24¾d.; wire, 24¾d.; rods, 23d.; tubes, 27¾d.; chill cast bars: solids, 23d., cored, 24d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 1s. 4¾d. per lb. (7%) to 2s. 1d. (30%); rolled metal, 3 in. to 9 in. wide, × .056, 1s. 10¾d. (7%) to 2s. 7d. (30%); to 12 in. wide, × .056, 1s. 11d. to 2s. 7¾d.; to 25 in. wide, × .056, 2s. 1d. to 2s. 9¾d. Spoon and fork metal, unsheared, 1s. 9¾d. to 2s. 5¾d. Wire, 10g., in coil, 2s. 3¾d. (10%) to 3s. 0¾d. (30%). Special quality turning rod, 10%, 2s. 2¾d.; 15%, 2s. 7d.; 18%, 2s. 11d.

Foundry Advisory Service

An important advisory service is being set up by the ironfounding employers through the joint action of the British Cast Iron Research Association and the Council of Ironfoundry Associations, in conjunction with the Joint Iron Council. B.C.I.R.A. will shortly appoint a team of suitably experienced men (in effect an operational research team), which can be called in by ironfounders who are seeking to raise the operating efficiency of their foundries to the highest possible standards. The team will be available to visit any foundry by invitation, and confidential reports will be made to the managements on any steps that may be needed to improve the performance, whether in relation to quality, output, cost or the best use of man-power.

Applications are being invited from three or four types of people—an executive with experience in management and costing; an engineer for planning and mechanisation; a metallurgist, and possibly a specialist in working conditions. This advisory service will supplement the efforts of the mutual aid groups which have already been set up co-operatively by some employers' associations in the industry.

The Council of Ironfoundry Associations, in association with the Joint Iron Council, has, in recent years, assumed a considerable measure of responsibility for the evolution of the industry on progressive lines, and the establishment of the new advisory service is a practical step towards attaining the national need of higher productive efficiency.

August-Thyssen Dismantling

A report from Germany states that the dismantling of the August-Thyssen works is making rapid progress. Up to the end of August, work had started on the dismantling of No. 1 and No. 5 blast furnaces; the total of blast furnaces to be taken to pieces is nine. Open-hearth furnaces and cupolas as well as the sheet-rolling works are also being taken down at present, and the lining is being removed in anticipation of the dismantling of the Bessemer converters.

German authorities estimated that dismantling would take several years, but in view of the fact that the installations are being taken down by flame-cutting and scrapped, it is expected that the dismantling of the August-Thyssen works will be completed by the middle of next year.

Obituary

MR. JOHN MACMILLAN, a director of R. & H. Green & Silley Weir, Limited, shiprepairers, etc., of Millwall Docks, and a number of other companies, died recently.

MR. JAMES DONALD BAIRD, formerly of James Donald & Company, iron and steel merchants, of Kilmarnock, has died at the age of 80. He was a partner in the firm with his brother, Mr. C. D. Baird, their father being sole partner in the latter part of the 19th century. The business was founded in 1748 and was wound up in 1943, when the two brothers retired.

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NOTICE

Situations advertised under this heading are available only to applicants excepted from the Control of Engagement Order, 1947, No. 2021.

SITUATIONS WANTED

ADVERTISER, M.I.B.F., 27 years' practical and administrative experience, ferrous and non-ferrous foundries, mechanised moulding experience and modern production methods, with experience of handling coloured labour, seeks position abroad (S.A. preferred); would be prepared to accept complete control; free to travel November, 1949.—Box 346, FOUNDRY TRADE JOURNAL.

DIE-CASTINF (gravity), practical and technical expert, seeks situation; 35 years' experience, 25 managerial; production from zero; design dies, build furnaces, etc.—Box 344, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN, with practical experience of all non-ferrous alloys; practical moulder, with experience of complete control of foundry; could train unskilled labour, supervise machine and general layout of pattern plates, etc.—Box 332, FOUNDRY TRADE JOURNAL.

STEEL FOUNDRY FOREMAN (31) desires change; sound practical knowledge all classes steel moulding; good technical training; keen disciplinarian; City and Guilds Certificate; A.M.I.B.F.—Box 338, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

APPLICATIONS are invited for an EXECUTIVE appointment in the Commercial Department of a large and important group of Non-ferrous Foundries in the London area; the man appointed will be responsible to the General Manager for the administration of this department; applicants should possess a sound knowledge of modern sales administration, and be experienced in the preparation of quotations and general correspondence with customers; the position offers good prospects to the right man and is pensionable. —Write, giving details of age, qualifications, salary required and experience, in chronological order, to Box 340, FOUNDRY TRADE JOURNAL.

ASSISTANT FOUNDRY ESTIMATOR required for Malleable Foundry.—Write, with full details, experience, age and salary required, Box 360, FOUNDRY TRADE JOURNAL.

ASSISTANT FOREMAN, Iron Foundry, required by well-known Midland Engineering Firm; machine moulding experience essential.—Box 362, FOUNDRY TRADE JOURNAL.

WANTED IMMEDIATELY.—Experienced moulder-trained Foreman; familiar with methods and piecework prices for Grey Iron Castings up to 10 tons; for position of ASSISTANT MANAGER in a Foundry of 100 men, near Birmingham.—Apply fully to Box 312, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

APPLICATIONS are invited for the position of WORKS MANAGER, to take charge of a small Foundry near Sheffield; qualifications required include absolute integrity, technical knowledge, sound practical experience and managerial ability; please give references, details of technical and practical experience, and state age, education and salary required.—Box 318, FOUNDRY TRADE JOURNAL.

BRITISH CAST IRON RESEARCH ASSOCIATION invites applications from a wide field for three or four posts in a team to visit, examine, and advise ironfoundries on efficient production; leader experienced in management, executive control and costing; engineer for planning, power-aids and mechanisation; metallurgist; a fourth post might cover working conditions. In view of cardinal importance of choosing the right men, no salary ranges or limits are stipulated.—Applications, marked "Confidential," to DIRECTOR, Alvechurch, Birmingham, by 14th October, 1949.

CHARGEHAND for new fully mechanised Moulding Plant; excellent opportunity for experienced machine moulder, used to high production speeds.—Apply, stating age, salary required, and full details of experience, OAKLEY BROS., LTD., Belle Vale Foundry, Cradley, Staffs.

EXCELLENT opportunity energetic practical FOUNDRYMAN, preferably already calling trade, sell new proposition interesting all foundries.—Box 952, FOUNDRY TRADE JOURNAL.

FOREMAN MOULDER required for Iron and Steel Foundry; Newcastle district; applicants should state age, education, experience and salary required. —Box 350, FOUNDRY TRADE JOURNAL.

FOREMAN for a Foundry 20 miles west of London, preferably with experience in manufacture of high-class steel and non-ferrous castings; must be able to prove success in previous positions.—Applications in writing, stating age, full details of experience, and salary required, to Box V.236, WILLINGS, 362, Grays Inn Road, London, W.C.1.

FOUNDRY FOREMAN required by important Engineering firm, London area, to take complete charge of Iron Foundry; capacity 150 tons a month; medium and light hand and machine moulded castings; this is an excellent opportunity for the right man and carries pension.—Write in confidence, giving age, experience, and salary required, to Box No. 235, MUNDY, GILBERT & TROMAN, 86, New Street, Birmingham

FOUNDRY FOREMAN wanted for Jobbing Iron Foundry on East Coast, adjoining seaside resort; weekly tonnage approx. 30 tons, green, loam and dry sand; machine moulding being developed; good prospects. Box 354, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

ALUMINIUM ALLOYS.—Firm in Midlands require a capable MANAGER for the production of 40 tons per week of various Aluminium Alloys from scrap, etc.; reply, stating age, remuneration, and experience, in strict confidence.—Apply Box 356, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER required by important Company in Midlands; applicants should have had experience in the production of light iron castings in fully and partially mechanised foundries, and knowledge of core blowing, and should be capable of the successful control of labour, up to 600 male and female; the position is a responsible one and offers excellent prospects; the successful applicant would become a member of Company's Staff Pension and Life Assurance Scheme.—Apply in the first instance, giving particulars of age, qualifications, experience and salary required, to Box 358, FOUNDRY TRADE JOURNAL.

MIDLANDS Malleable Ironfounders (Whiteheart) require FOREMAN, to take charge of Annealing Department; must possess initiative, energy and ability to handle labour; full knowledge of process and experience of pulverised fuel plant essential.—Write, stating age, experience, and salary required, Box 348, FOUNDRY TRADE JOURNAL.

PATTERN-MAKER for plate and loose patterns; Braintree district.—Full particulars of experience to Box 336, FOUNDRY TRADE JOURNAL.

THE ANDERSON FOUNDRY CO., LTD., Railway Permanent Way Engineers and Ironfounders, require the services of an ASSISTANT WORKS MANAGER; applicants should have sound practical training and experience, and possess A.M.I.Mech.E. or equivalent qualification; administrative experience an advantage; age group 30/35 years; initial salary according to age, experience and qualifications; good prospects for the right man.—Apply to THE SECRETARY at Port Clarence, Middlesbrough.

WEST COUNTRY FOUNDRY require fully experienced working CUPOLA MAN; at present melting 15 to 20 tons per week; good wages, and partly furnished self-contained flat available; all applications will be treated as strictly confidential. —Box 300, FOUNDRY TRADE JOURNAL.

WANTED. — Practical FOUNDRYMAN for small Foundry in Yorkshire; must be capable of taking complete charge; financial interest considered if desired.—Box 364, FOUNDRY TRADE JOURNAL.

WANTED URGENTLY.—Experienced dry sand IRON MOULDERS AND COREMAKERS; castings up to 15 tons; general engineering work, Birmingham district; piecework and output bonuses and excellent pension fund; permanencies to really skilled tradesmen.—Apply fully to Box 314, FOUNDRY TRADE JOURNAL.